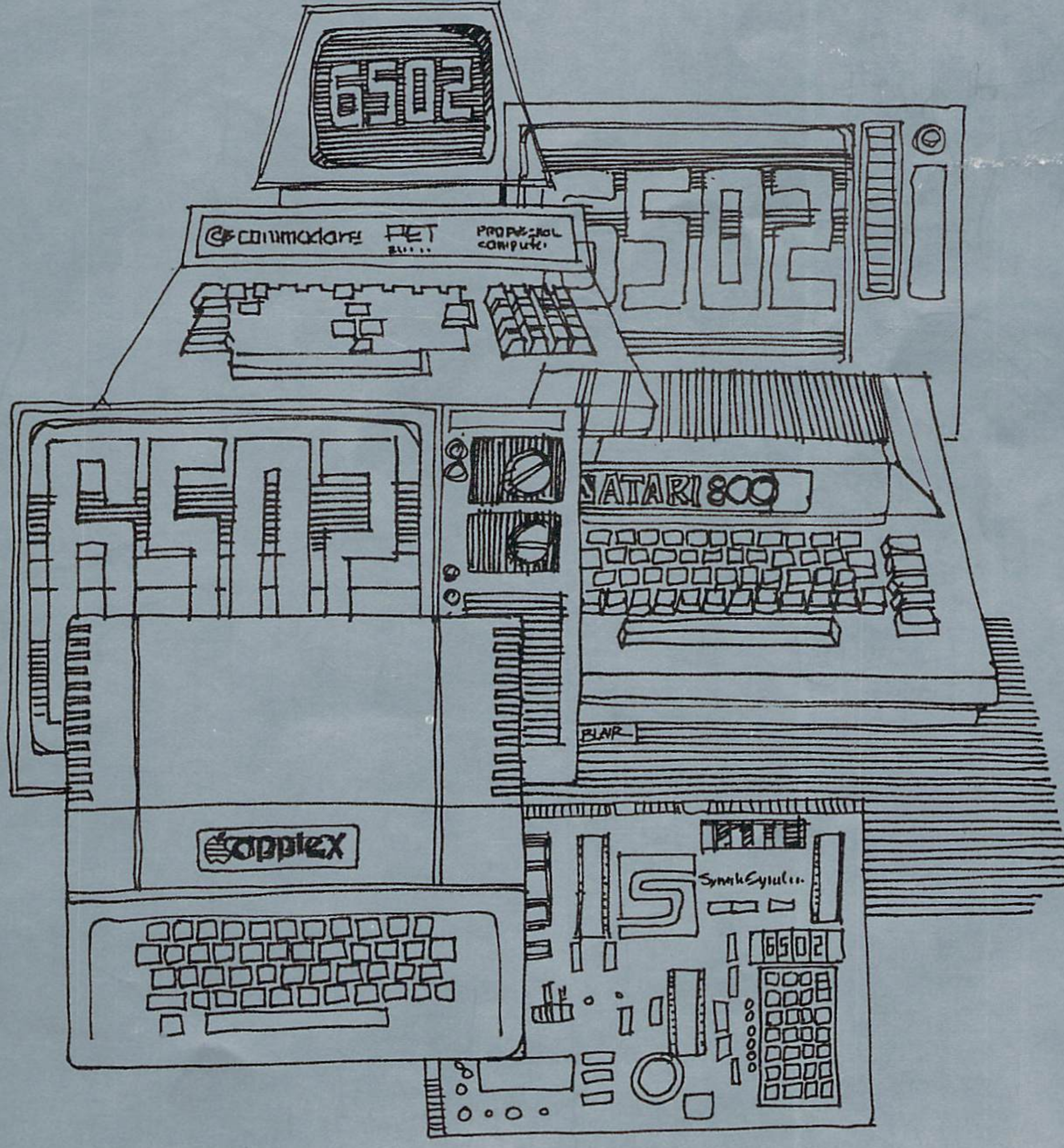
FALL. 1979. ISSUE 1. **$2.00**

The PET® Gazette With A New Name.

COMPUTE.

The Journal for Progressive Computing™


6502
commodore PET
professional computer
6502
6502
ATARI 800
BLAIR
apple][
SYM
Synertek Systems
6502

softside software

305 Riverside Drive. New York, N.Y. 10025

the pet program.

1 GRAPHICS PAC 2

Quadruple your PET's *graphic resolution*. Why be stuck with the PET's cumbersome 25 x 40 1000 point display. With Graphics Pac you can directly control (set and clear) 4000 points on screen. It's great for *graphing, plotting, and gaming*. Graphics Pac allows you to plot in any combination of two modes: 4 Quadrant graphing with (0,0) center screen, and Standard graphing with (0,0) plotted in the upper left hand corner. Complete documentation shows how you can *merge* this useful routine with any of your own programs *without retyping* either one! All this on a high quality Microsette for only $9.95.

2 ASSEMBLER 2001

A *full featured assembler* for your PET microcomputer that follows the *standard set of 6502 mnemonics*. Now you can take full advantage of the computing abilities of your PET. *Store* and *load* via tape, *run* through the SYS or USR functions. *List* and *edit* too with this powerful assembler. No other commercial PETassembler gives you all these features plus the ability to *look at* the *PET'S secret Basic* ROMs *all in one program*. This valuable program is offered at $15.95.

3 BIKE

An *exciting new simulation* that puts you in charge of a bicycle manufacturing empire. Juggle inflation, breakdowns, seasonal sales variations, inventory, workers, prices, machines, and ad campaigns to keep your enterprise in the black. *Bike is dangerously addictive*. Once you start a game you will not want to stop. To allow you to take short rest breaks, Bike lets you store the data from your game on a tape so you can continue where you left off next time you wish to play. Worth a million in fun, we'll offer BIKE at $9.95.

4 PINBALL

with sound!

Dynamic usage of the PET's graphics features when combined with the fun of the *number 1 arcade game* equals an *action packed video spectacle* for your computer. Bumpers, chutes, flippers, free balls, gates, a jackpot, and a little luck guarantee a great game for all. $9.95.

5 SUPER DOODLE

Give your PET a workout. This program really *puts the PET's graphics to work*. Super Doodle lets you use the screen of your PET like a *sketch pad*. Move a *cursor* in eight directions leaving a trail of any of the 256 charactrs the PET can produce. New features include *an erase key* that automatically remembers your last five moves, a return to center key, and clear control. *Why waste any more paper*, buy Super Doodle for only $9.95.

6 DRIVING ACE

Non stop excitement with a fast moving, high paced version of your favorite video arcade racing games. Shift up! Shift Down! Watch your gas, and be careful on those hairpin turns. This dynamite tape has the two most common arcade racing games specially adapted to run on your PET computer. Driving Ace simulates an endless road packed with tight turns and gentle, but teasing, twists. Starting with fifty gallons of gas, how far can you go with a minimum of accidents? Grand Prix places you and your car on a crowded racing track. Race the clock and be careful steering around the fast but packed Grand Prix track. $9.95

Dealer Rates On Request

Authors: We offer UNBEATABLE royalties

Subscription Information:

We're trying something we think is new in subscription options, a "third" level of domestic distribution. Our newstand price is $2.00 a copy. Our "mail-order" subscription price is $9.00. That price is based on a six-issue year — in January we become bi-monthly. Our third level is called a "retail" subscription. You subscribe through us for a six issue year at $7.50. At the time you subscribe, you designate a local retail store where you'd like to pick up your copy each issue. We'll include your copy with the dealer order and you can pick it up as soon as it arrives. No extra charges ... If you move, let us know where, and we'll send you a list of participating dealers in your new location. You get a first hand reference to computing resources in your new location, and your retail subscription follows you. If you visit a neighborhood store periodically try the retail subscription. It saves us both time and money. If you prefer the direct to your mailbox service of a "mail-order" subscription, our rates are reasonable. Happy Computing.

Authors of manuscripts warrant that all materials submitted to COMPUTE. are original materials with full ownership rights resident in said authors. By submitting articles to COMPUTE. authors acknowledge that such materials, upon acceptance for publication, become the exclusive property of Small System Services, Inc. Unsolicited manuscripts not accepted for publication by COMPUTE. will be returned if author provides a self-addressed, stamped envelope. Program listings should be provided in printed form as well as machine readable form. Articles should be furnished as typed copy with double spacing. Each page of your article should bear the title of the article, date and name of the author.

Address all manuscripts and correspondence to COMPUTE. Post Office Box 5119, Greensboro, N.C. 27403. Materials (advertising art work, hardware, etc.) should be addressed to COMPUTE., 900 Spring Garden Street, Greensboro, N.C. 27403.

Entire contents copyright © 1979 by Small System Services, Inc. All rights reserved. "COMPUTE. The Journal for Progressive Computing" is a trademark of Small System Services, Inc. ISSN 0194-357X

COMPUTE. is published by Small System Services, Inc. We are not connected in any way with the former publisher of The PET Gazette, the Microcomputer Resource Center of Madison, Wisconsin, a dissolved non-profit corporation.

COMPUTE. assumes no liability for errors in articles or advertisements. Opinions expressed by authors are not necessarily those of COMPUTE.

Domestic U.S. Pricing:

Retail Subscriptions are available only in the U.S. and Canada. In Canada add $.50/issue at all levels.

U.S.	Newstand	$2.00/issue
	Mail	$9.00/6 issue year
	Retail	$7.50/6 issue year

Europe: Air Mail subscription U.S. $22.50/six issue year

Foreign subscriptions and sales should be paid in United States funds drawn on a U.S. bank.

Other areas: inquire for air mail rates.

Staff of COMPUTE.
Robert C. Lock, Acting Production/Coordinating Editor.
Belinda Church Hulon, Editorial Assistant.
Carol Holmquist Lock, Circulation Manager.

Software/Hardware Lab assistance furnished by the staff of Small System Services, Inc.

Len Lindsay, Senior Contributing Editor for Commodore Products.
Harvey Herman, SBC Contributing Editor.
David Gibbs, Art Director/Design Consultant.

Our "first issue" thanks to Camera Graphics, Graphix House, Greensboro Printing Company and The Design Group.

PET is a trademark of Commodore Business Machines, Inc.
Apple is a trademark of Apple Computer Company.
Atari is a trademark of Atari, Inc.

TABLE OF CONTENTS

Selecting and Developing Small Business Systems — Potential Problems & Pitfalls Mike Sawyer, page **4.**
Sorting Sorts: A Programming Notebook, Rick & Belinda Hulon, page **7.**
Len Lindsay Reviews Three Word Processors —
  An Overview page **13.**
  Commodore Business Machines page **14.**
  Connecticut Microcomputer page **17.**
  Programma International page **19.**
Microcomputers for Nuclear Instrumentation, J.S. Byrd, page **24.**
Tokens Aren't Just For Subways: Microsaft Basic Harvey Herman, page **29.**
Universal 6502 Memory Test PET, Apple, Sym and Others Carl Moser, page **32.**
Microcomputers in Education Pierre Barrette, page **33.**
Flying With PET Pilot: Kids and Microcomputers At Peninsula School, Katie and David Thornburg, page **40.**
Teachers, Computers and The Classroom, C.J. Carr and Everett Carr, page **42.**
Atari Computers: The Ultimate Teaching Machines? John Victor, page **62.**
The Evolution Of A Magazine Len Lindsay, page **65.**
Pet In Transition — ROM Upgrade Map, Jim Butterfield, page **68.**
A Commodore Perspective Bob Crowell, page **71.**
Retrofitting ROMs Larry Isaacs, page **76.**
PET Screen Print Routine David Malmberg, page **78.**
TRACE For The Pet Brett Butler, page **84.**
32K Programs Arrive Len Lindsay, page **86.**
Using Direct Access Files With The Commodore 2040 Dual Drive Disk Chuck Stuart, page **93.**
Mastering The Ohio Scientific Challenger 1P, Keith Russell & Dave Schultz, page **97.**

REVIEWS:

Review Policy, page **3.**
D.C. Hayes Micro Modem, page **30.**
PET SET 1a, page **31.**
Petunia & Petunia Player, page **42.**
Corvus 11A Disk Drive, page **61.**
New-Cursor (Hardware), page **79.**
New-Cursor (Hardware), page **82.**
Macro Assembler And Text Editor: Sym Version, page **100.**
Challenger 1P, page **101.**
Aim 65, page **104.**

ADVERTISERS INDEX

AB Computers	77
Abacus Software	81, CBG: 57
Automated Simulations	80, CBG: 60
Byte Shop	CBG: 57
Channel Data Book	38
Commodore Business Machines	9, 10, 11, 12
Competitive Software	CBG: 58
Computer Associates	21
Computer Power For Business	IBC
Computer World	63, CBG: 52, DR
Connecticut Microcomputer	15, 22, 23
Creative Computing	CBG: 46, 47, 48, 49, DR
Cursor	91
Datasoft Research	92, CBG: 50
Dr. Daley	18, CBG: 60
Eastern House Software	CBG: 59
Electronic Specialists	81, CBG: 60, DR
Excel	88, 90, CBG: 57
Excert	101
Innovision	74
Iridis	42
Micro Computer Industries	90
Micro Technology Unlimited	6, CBG: 56
Microphys Programs	43, CBG
New England Electronics Co.	27, 39
Newman Computer Exchange	67
P.S. Software	88
Peninsula School	36
Programma International	BC
Program Design	35, CBG: 53, DR
RNB Enterprises	99, CBG: 55
Sawyer Software	73
Seawell Marketing	103
Steven E. Shaw, P.E.	88
Skyles Electric Works	16, 28, 29, 83, CBG: 54, DR
Softside Software	IFC
Textcast	75
Total Information Services	90
Ziegler Electronics Company	20
Compute Subscriptions	CBG: DR, DR, DR

CBG Christmas Buyers Guide
DR: Direct Response Card

PUBLISHER'S REMARKS

Welcome to the last "Super" issue of The PET Gazette, and the first "Super" issue of COMPUTE. Whether you're an old or new reader, you should read Len Lindsay's article on the evolution of the magazine. It'll tell you more about where the magazine began, and provide some context for the Resource Sections, the "Gazettes," the Review Form, and so on.

The PET Gazette built its name by serving as a resource journal. We expect to continue that tradition, not only in relation to Len's activity as Senior Contributing Editor for Commodore products, but other editorial activity with the additional 6502 products being added to the magazine.

We won't review a product from a press release. When you see a review in COMPUTE, you'll know it exists. We cannot always guarantee that it exists in quantity (e.g. note the Atari review ... John Victor reviews from experience. He has his hands on one of the very few that Atari has released to their suppliers), but that's the nature of the business these days. If we're reviewing a prototype, we'll try to tell you.

We'll reiterate Len's trusted warning: Never buy a product unless you're sure it exists. We try to screen our advertising, but that's not even a sure bet, so trust the reviews you see here, and article reviews you see elsewhere. World Power has given the industry some new problems, and we need to develop ways to protect ourselves in the future.

One last comment on "prototype" reviews. The lead time in the publishing industry is tremendous ... frequently 4-5 months. In fairness to developing companies, we'll review prototype products as one means of shortening that lead time. We'll make it clear in the review that the product is a prototype and may suffer as such from developmental bugs and hasty documentation. Nonetheless we think it will service both readers and "emerging" companies.

I'll be interested in comments on such a practice from manufacturers and readers. For additional information on our review policies and practices, see the facing page.

Small System Services, Inc. of Greensboro, NC is the publisher of COMPUTE. Among other things, our company runs a retail store (The Corner Computer Store) and has an R&D/new product division. We're offering this information up front because we see no point in trying to avoid the fact that we're a multi-faceted company. Some articles are contributed by our staff (see ROM Retrofit installation and Sorting Sorts). These are intended to be service articles. We treat the magazine as a totally separate operation of our company. It will be as objective and fair as it has always been.

COMPUTE is not a non-profit magazine (at least it's not intended to be), but we fully intend to maintain the access to resources and informative approach of the original non-profit PET Gazette.

As you can see from the Table of Contents, we've organized the magazine into four major "Modules." These modules will continue to provide the basis for each issue of COMPUTE.

1. 6502 Section: This part of the magazine is intended to provide articles of interest to everybody with a machine with a 6502 inside. If you're writing an article for this section, it needs to apply to more than one machine, or be generalizable to other 6502 machines.
2. Business and Industrial: This section of the magazine is devoted to business and industrial applications of 6502 based machines. The articles will be of general interest to both learners and "doers."
3. Education: This section is intended as a resource guide to teachers actively involved in the use of microcomputers, and equally to teachers considering involvement.
4. The Gazettes: For your own "special" machine, we offer a PET Gazette, an Atari Gazette, an Apple Gazette, and for now, an SBC Gazette (Single Board Computer Gazette — ouch). In the Gazettes, you'll find material of specific interest; articles, reviews, new products and resources. Naturally we're strongest this issue with the PET Gazette, closely followed by the SBC Gazette. The Atari Gazette is off to a good start, and we expect Apple to catch up by the next issue. We'll look forward to your comments, reviews and articles. Welcome to COMPUTE.!

In January, we'll begin a column called the GAP, where we'll "discuss" problems, products, etc. We want the GAP to promote a dialogue between manufacturers and consumers. Nothing makes it to the marketplace that's all good or all bad. The GAP will attempt to investigate these "margins." Among other things, January's column will comment on that little piece of red plastic on the SYM-1, Commodore's documentation, and OSI. We're sure, by then, Atari and Apple will be included as well.

Enjoy this issue. Send us your comments, suggestions and complaints. We'll see you in January.

Robert Lock

HELP!

Beginning in January, Compute. will offer a HELP! column in each section of the magazine (as demand warrants). If you have a problem, question, complaint, etc. write to me at Compute. Be sure to write "HELP! Column" on the lower left corner of the envelope. We'll farm out your requests to "HELPful" persons in business, industry, education and so on as available and try to answer in the next issue. Please understand that requests cannot be answered personally, and that all requests for HELP! will not be responded to in the HELP! columns.

RCL

Review Procedures:

1. Games:
   Please make copies of the review form on the facing page for contributing Reviews and comments on existing games and simulations. When you pick up a copy of a new game, sit down and fill out a sheet for us after you've spent some time with the documentation and software.

   We'll run a tabulation of "Scores" in each issue. Be sure you provide all of the requested information.
2. Hardware:
   Use copies of the same review form. It tells us what exists, and helps us present our readers with a balanced review of new products. Whenever possible, we'll back up solicited review articles with summaries from your review forms.

Educational and Business Software

We are recruiting reviewers for our "Practicing" Review Panels. If you're an Educator or Business person who's engaged in using micros in daily work, please drop us a note providing the following information:

1. Position, location, number of years involved with computing, hardware used (e.g. external storage devices and so on), curriculum area/business-professional area/industrial applications area, etc.
2. Please indicate your willingness to review:

   General purpose software; software within your area of specialization, etc.

Qualifications:

Reviewers may not be engaged in the writing or marketing of software within vertical markets. E.G. if you sell or write Educational software, we won't accept your review of someone elses. We will consider your comments on the payroll package you buy from someone else to handle your own business records. Fair enough?

In writing review articles, please address these points:

Documentation:
- Clarity
- Usefulness
- Adequacy (Does it cover the topic?)

Software:
- Depth
- Sophistication
- Value
- Relevance
- Ease of Use
- "Necessity of skill"

Please use the general purpose review form as an indicator of areas to cover in review articles.

COMPUTE NEEDS YOU!

COMPUTE.
The Journal for Progressive Computing.

Date ____________________

Product Name: ____________________

Manufacturer/Distributor:

____

____

____

Suggested Retail Price: $______.______

Reviewer Information:

Name Age Sex

____

____

____

____

(Note: We request age and sex information only for the purpose of better targeting our reviews ... e.g. some programs may be unanimously praised by "older" reviewers and panned by those younger. We'd be helping both groups if we could point that out!)

Machine: PET ____ APPLE ____ ATARI ____

OSI ____ AIM ____ SYM ____ KIM ____ Other ________

SCORING: ______

Lowest Average Highest
0 1 2 3 4 5 6 7 8

1. Documentation:
   - Clarity and Readability ______
   - Comprehensiveness ______
2. Software:
   - Ease of use ______
   - Originality ______
   - Error Handling ______
   - Use of Machine Capability ______
3. Hardware:
   - Ease of installation ______
   - Ease of use ______
4. Is it worth it?
   - Uniqueness ______
   - Challenge (Interest) ______
   - Quality (Amateurish - Well Done) ______
5. Educational Value
   - Presents facts; develops skills ______
   - Ease of learning ______
   - Age Breadth (limited - broad) ______

GENERAL INFORMATION:

Would you buy it now? ______

Would you recommend it for:

"Beginning" Computerists? ______

"Intermediate" Computerists? ______

"Advanced" Computerists? ______

All Computerists? ______

Comments:

SELECTING AND DEVELOPING SMALL BUSINESS SYSTEMS

Potential Problems And Pitfalls

By Michael Sawyer, President of Sawyer Software

As microcomputers become more powerful and inexpensive and personnel salaries increase, the use of the microcomputer for business applications becomes more and more attractive. The small businessman however, unaware of whether the capabilities of the microcomputer can meet his company's needs or interface properly to existing applications, is left with a monumental decision. This article will address itself to aiding the small businessman in answering this question.

There are four main elements to any computer "system." These are hardware (the actual computer equipment used), software (programs used to instruct the hardware what to do), personnel required to operate the system and the procedures necessary to accomplish any given task. It is extremely important for the small businessman to consider a system rather than just the equipment used.

I've talked to many a small businessman who after investing thousands of dollars in equipment found no software to fit their application or found interfacing their application to their computer equipment both frustrating and expensive, if not impossible.

PITFALL #1

> Without the other elements of a computer system a piece of computer equipment is useless.

Before evaluating each of the four elements of a computer system the small businessman must define what applications he would like to involve the computer with and define his purpose in utilizing a computer system. If the purposes are cost and time effectiveness, he must define present cost and time necessary to complete a particular application, to have some degree of comparison to the microcomputer system.

PITFALL #2

> Without fully defining current applications or present costs the small businessman loses any prospective of comparison and often ends up with an inadequate computer system.

Some standard applications which are suited to the microcomputer are Payroll, General Ledger, Accounts Receivable, Accounts Payable, Word Processing and in certain instances Inventory Control.

When defining your application divide it into three parts. The first is the information required to implement a specific application. Below is a payroll example:

NAME
ADDRESS
SOC. SEC. #
SALARY/HOURLY RATE
MARRIED/SINGLE
OF EXEMPTIONS
EMPLOYEE #
YR TO DATE, QUARTERLY, CURRENT FOR THE FOLLOWING:
GROSS
FED
FICA
STATE
CITY TAX
OTHER DEDUCTIONS

The next section is what the computer is to calculate or figure:

FEDERAL TAX
FICA TAX
CITY TAX
NET PAY, etc.

The last section is the reports or print-out you want:

W2's, 941's, Payroll Register, Name changes/additions, Cost accounting-payroll summary, checks, etc.

By this time you should have a good idea of your present cost and time involved along with your defined applications. It is important to be properly prepared before purchasing any equipment.

There are several things to keep in mind before "shopping" for a microcomputer system. The first element of the microcomputer system is the hardware.

HARDWARE

There is so much hardware available on the market today it is difficult to know what to choose. Also many companies are having financial trouble or have left business completely. When purchasing a microcomputer, it is probably best to consider the popularity of the microcomputer. The top three selling microcomputers of 1978 were the TRS-80, PET and Apple (in order of sales). I am not inferring they are the best or the only microcomputers that can be used, but because of their popularity these microcomputers have more software available for them than other microcomputers and can usually interface to more peripherals such as floppy disks, fixed disks, printers, etc.

PITFALL #3

> An unpopular microcomputer may not be well supported by software companies, user groups, or peripheral companies and therefore end up with a very short life or lack of long term support by the microcomputer industry.

My suggested minimum system for a business environment is a system with at least 32K, two floppy drives and a printer. The price for such a system will be $3,500.00 or more. Some small businessmen may be able to use a cassette based system, dependent upon the volume of accounts, reducing that figure by $1,000 to $1,500.00. However, for reliability and speed the floppy disk is certainly worth the extra cost.

In considering any hardware, service is important. Find out who will service the equipment, where they are located and how long (maximum) it will take, along with what the charge rates are. Radio Shack is the only microcomputer company I know of that has a service contract, although most computer stores will service the equipment they sell.

SOFTWARE

There are three basic ways of obtaining software. The first is "custom" software which is designed for your individual company. It is usually the best, but also the most expensive. It can easily cost as much in custom software as the hardware to build your system. The second type is "canned" software, which is what most software on the market for microcomputers is. It is generally less expensive than custom software, but usually incorporates only standard features of a certain application. It will lack non-standard reports or information your company may need. The third type is a hybrid — a "canned" program which is modified for your own company. This type of software is becoming a more popular type to achieve low cost and still fulfill the specific needs of your company.

If you have a computer store near you, that is the best place to evaluate software. Use the application sheet you used to define each application to make sure the software fits your application. Simply buying a Payroll or General Ledger package without evaluation is like walking into a clothing store and buying a suit without trying it on.

If no computer store is available contact a software company about your application. Most software companies offer brochures, but often the brochure will not answer all the questions you may have. Writing a letter explaining exactly what the software must do will give you the feedback you need to make a decision. Ask for print-outs of any reports the application generates and when the program will be delivered. Also ask about custom programming charges to modify the program if necessary and what documentation is available for the software.

PITFALL #4

> Failing to evaluate software before purchasing may lead to an inadequate microcomputer system.

PERSONNEL

Operating a microcomputer is a learning experience which requires time and patience. Some people have a natural ability when operating a microcomputer, while others find it very difficult. This factor alone can substantially affect whether the microcomputer becomes a tool or a nuisance. All personnel that will be involved in operating the microcomputer should have several hours of "hands-on" experience if at all possible. Comments from personnel will aid upper management in the decision making process.

PITFALL #5

> Failure to involve personnel who will be responsible for data processing with the computer system at the initial level may result in a large amount of lost time or frustration for the personnel involved with the computer system.

PROCEDURES

Procedures are an important element of the computer system and are usually dependent upon the application software. Procedures should be simple to perform yet provide the necessary functions for your application. Adequate backup is a must, for each diskette can hold a mass of information which can be lost in a number of ways. Procedures should cover methods to edit or change data. Program response when you key in incorrect data is almost as important as if you key in correct data.

PITFALL #6

> Confusing procedures cause confused personnel, loss of time and money.

The computer store is a valuable place to evaluate the microcomputer system. Be sure to take the person who will be responsible for operating the microcomputer with you on any "shopping" trips. If at all possible let them operate the microcomputer rather than the computer store owner, so they can get a "feel" for the system. Be sure to ask the owner the following questions:

> Does the store provide training for your personnel?
>
> Who will service the computer, when are service times and how long can it take?
>
> What additional equipment will interface to the microcomputer system, if you need further expansion?
>
> Can you get software modified and what is the cost for such modification?
>
> What is the maximum number of accounts or employees the system will handle and how can you add more in the future?

Look at several microcomputer systems and don't buy on impulse. Substantiate your need to buy the microcomputer system. In the end you'll find the time involved will pay off.

MICRO TECHNOLOGY UNLIMITED

FIRST IN MICROPROCESSOR TECHNOLOGY

- *Developed the first full page display (66 line 102 characters/line) word pro-processing system in 1972 (Now the A.B. Dick MAGNA-SL)*
- *Invented the first high quality Fourier synthesized 4 voice music system for the 6502*
- *Designed the first high resolution (320 x 200) graphic video display for the 6502*
- *Introduced the first 16K memory expansion board for the KIM-1*
- *Manufactured the first high resolution graphics enhancement board for the Commodore PET*

JUST LOOK AT OUR FIRST STRING LINEUP FOR THE KIM/SYM/AIM AND PET COMPUTERS

- *K-1000 series of custom power supplies for the KIM-1 and Aim-65*
- *K-1002 series of digital-to-analog music boards for the KIM/SYM/AIM and PET computers*
- *K-1005 5-slot motherboard/card files for KIM/SYM/AIM and PET expansion*
- *K-1007 PET bus to KIM bus interface and video processor*
- *K-1008 320 x 200 bit map graphics display with 8K memory*
- *K-1012 12K 2708/TMS2716, EPROM programmer, serial and parallel I/O*
- *K-1016 16K super low power (1.6 watts) high reliability memory*
- *K-1020 Wire-wrap prototyping board with on-board regulators*
- *Advanced software packages to support our products*

WITH MORE FIRSTS UNDER DEVELOPMENT

- *Double-density floppy disk controller with 16K RAM and DMA transfer*
- *Super Visible Memory with 640 x 400 and on-board 3mHz 6502*
- *Intelligent music synthesizer with 8 voices*
- *Audio digitizer board for speech and music analysis/synthesis*

WHEN YOU THINK 6502 LOOK TO MTU FIRST FOR THE BEST IN PERIPHERAL PRODUCTS

MICRO TECHNOLOGY UNLIMITED
div. of Consolidated Sciences Inc.
845 Galaxy Way
P.O. Box 4596
Manchester, NH 03108
(603) 627-1464

Sorting Sorts: A Programming Notebook

Belinda Hulon
Rick Hulon, Manager, The Corner Computer Store

An important aspect of many business applications involving microcomputers is the selection and efficient use of an appropriate sorting routine. While sorting routines are readily available in the literature and/or easily programmable, some thought should be given to the type of sort used. This two-part article will deal with six of the better known sorting algorithms: Selection Sort, Bubble Sort, Shell Sort, Quick Sort, Merge Sort, and Heap Sort. These sorts range from very simple to quite complex, from extremely slow to exceedingly fast. This first article will concern itself with the simpler, slow to intermediate sorts.

In this article we evaluate Selection Sort, Bubble Sort and Shell Sort. Selection Sort is a very simple, straight-forward routine (see Figure 1). Its methodology is to iteratively pass through the list of items to be sorted. On the initial pass, the first item is compared with each successive item, exchanging it with any element that is "less than" the first item. The "new" first element is then compared to each item after the point of exchange. This process continues until one entire pass is completed. The procedure is then repeated for the second item in the list, then the third, etc., until the last item is reached. Thus, Selection Sort essentially "selects out" the smallest item on the first pass, the next smallest on the second, and so on. This sort, then, always goes through a set number of passes regardless of the state of the list. An already sorted list would still go through the entire routine as though it were not sorted.

Bubble Sort accomplishes its task not by comparing one item to all the others as in Selection Sort, but rather by comparing adjacent elements in the list, switching whenever necessary. In addition, it sets a flag to indicate when no exchanges have been made in a given pass, thus signalling the end of the sort. Bubble Sort therefore takes only as many passes as it needs. An already sorted list would use one pass to determine that no exchanges were made. A listing of Bubble Sort can be found in Figure 2.

The third sort to be considered, Shell Sort, is somewhat more complicated. Shell Sort is essentially an extension of Bubble Sort. Initially a "gap" size is determined to be the largest integer less than or equal to half of the list size (e.g., if the list contained 11 items, the initial gap size would be 5). This gap size supplies the essential difference between Shell Sort and Bubble Sort, for instead of only comparing adjacent items, Shell Sort compares items separated by the gap size, exchanging them when necessary. Once it determines that no exchanges were made on the last pass with a particular gap size, the size of the gap is cut in half and the process continues. As one can easily see, this results in a Bubble Sort when the gap size becomes 1, but since the list is already partially sorted, it does not require as much time for larger lists as a regular Bubble Sort would. Shell

```
10 FOR I=1 TO N-1
20 FOR J=I+1 TO N
30 IF V(I) <= V(J) THEN 70
40 S=V(I)
50 V(I)=V(J)
60 V(J)=S
70 NEXT J
80 NEXT I
90 END
```

Figure 1

```
10 F=1
20 IF F=0 THEN 120
30 F=0
40 FOR I=1 TO N-1
50 IF V(I)<=V(I+1) THEN 100
60 S=V(I)
70 V(I)=V(I+1)
80 V(I+1)=S
90 F=1
100 NEXT I
110 GOTO 20
120 END
```

Figure 2

```
10 GP=N
20 IF GP<=1 THEN 160
30 GP=INT(GP/2)
40 MI=N-GP
50 F=0
60 FOR I=1 TO MI
70 GI=GP+I
80 IF V(I)<=V(GI) THEN 130
90 S=V(I)
100 V(I)=V(GI)
110 V(GI)=S
120 F=1
130 NEXT I
140 IF F=1 THEN 50
150 GOTO 20
160 END
```

Figure 3

```
WHERE:
V =Array containing data to be
   sorted
S =Holding variable used for
   exchanging items
N =Number of items to be
   sorted
F =Flag indicating occurrence
   of an exchange
GP =Gap size
MI =Number of times the loop
    must be iterated on one
    pass; depends on gap size
GI =Index for comparison;
    depends on gap size
```

Sort, like Selection Sort, does not provide for an "easy out." However, it does not go through the routine a set number of times. a pre-sorted list will require only enough passes to obtain a gap size of 1, since there will never be any exchanges. (See Figure 3).

Several factors are involved in determining the efficiency of a sorting algorithm. The time involved, or the speed of the sort, is usually one of our major concerns, especially with micros. Two important factors contributing to the speed and efficiency of a sort are the number of comparisons made and the number of actual exchanges involved in sorting a list. In this case we counted any comparison made (including the checking of flags), not just data comparisons. Although we are not directly concerned with CPU time in terms of actual cost, it seems obvious that the fewer comparisons and exchanges made in the same (or less) amount of time, the more efficient the sort will be. These three factors then, time, number of comparisons and number of exchanges comprise our criterion for comparison. The actual method used was to generate 30 different lists of random numbers, having each algorithm sort each list. The 30 values for each of the criterion for the different list sizes were averaged to produce the values given in Table 1. This procedure was followed for lists of size 10, 25, 50 and 100. All data was obtained from a Commodore CBM with 32K of internal RAM.

TABLE 1

BUBBLE SORT

List Size	Number of Comparisons	Number of Exchanges	Time
10	75	21	1.8 s
25	508	153	12.4 s
50	2098	592	50.7 s
100	8811	2450	3.6 m

SELECTION SORT

List Size	Number of Comparisons	Number of Exchanges	Time
	45	21	1.1 s
	300	144	7.3 s
	1225	505	28.0 s
	4950	1815	1.8 m

SHELL SORT

List Size	Number of Comparisons	Number of Exchanges	Time
	72	11	1.5 s
	339	63	7.4 s
	967	155	20.9 s
	2669	399	57.2 s

WHERE:
s = seconds
m = minutes

It should be noted that upon beginning this article there were some basic expectations. Having already run a similar project on a large computer, we expected similar results from the CBM. The initial project showed, true to the numerous textbooks available, that while Selection Sort and Bubble Sort were good for small lists (even superior to more sophisticated sorts), Shell Sort would be better for larger lists. Also, Selection Sort should be faster than Bubble Sort, due to the nature of the algorithms (we omit the mathematical determination of this situation). In this experiment we did duplicate our first results fairly well, as can be seen from Table 1. However, the amount of time involved seemed flabbergasting. Of course, we could not have expected a micro to compare in speed to a mainframe, but the differences were disturbing. For example, the time involved in the sorting of a list of 500 items by one of these sorts ran into hours, somewhat troublesome for business applications. Having mulled over this for awhile we came to a tentative conclusion which seemed to explain this occurrence. Our original sorting routines were written in PL/1, a batch language for use on an IBM 360/370. In this situation the source code went through a compiler which translated it into machine code for execution. On our CBM, however, the routines were written in interpreted BASIC. One important difference between an interpreter and a compiler is that with a compiler the source is "compiled" only once. The machine code is produced and the higher level language is no longer a concern. With an interpreter, on the other hand, each line of code is interpreted EVERY time it is encountered. This, then should account for much of the excessive time observed. As a test, we wrote Selection Sort (chosen for its simplicity) in machine code. This eliminated the interpretation stage. This gives us a better idea of just how much time is actually involved in sorting the lists. The elimination of an interpreter changed the time involved drastically. While the BASIC routine required 1.1 seconds to sort a list of only 10 items, the machine code version took so little time as to record a duration of 0 seconds! Since the built-in timer of the CBM records time in "jiffies" or 1/60 of a second, it actually took less than 1/60 of a second to sort the list. The results are even more impressive for a list of 100 items. While BASIC required 109.2 seconds (just under 2 minutes) the machine code version required only .2 seconds. In other words, the BASIC algorithm took 546 times longer than did the machine code routine. Much of this extra time, then, seems to be a result of the BASIC interpreter. Thus, what might seem to be a very efficient sort could actually prove to be worse than a less efficient sort, depending on the amount of code involved and the number of items to be sorted. In the design of business software, as much attention should be paid to the language (and therefore type of compiler or interpreter) as to the type of sort involved. If you are willing to work with machine code then more efficient sorts should be considered. We will include machine code listings in the next article along with the evaluations of Quick Sort, Merge Sort, and Heap Sort.

TABLE 2

List Size	Time for BASIC routine	Time for mach. code routine
10	1.1 sec	0.00 sec
25	7.3 sec	0.02 sec
50	28.0 sec	0.05 sec
100	1.8 min	0.17 sec

commodore

Effective Date Oct., 1979

COMMODORE WISHES TO SAY
THANK YOU
TO OUR OVER 400 AUTHORIZED DEALERS

Authorized Dealers

commodore
Professional
Computer

ALABAMA

BERNEY OFFICE EQPT.
1718 Vaughn Rd.
Montgomery, AL 36109
205-277-1601

BYTE SHOP
3156 University Dr. N.W.
Huntsville, AL 35805
205-539-3444

COMPUTERLAND
3020 University Dr. N.W.
Huntsville, AL 35805
205-539-1200

GRICE ELECTRONICS INC.
3696 Airport Blvd.
Mobile, AL 36608
205-342-2062

THE LOGIC STORE
Lagoon Prk. Shopping Vlge.
Montgomery, AL 36117

THE LOGIC STORE
3808 Pepperell Parkway
Opelika, AL 36801
205-745-7735

RICKLES ELECTRONICS
2800 Meighan Blvd.
Gadsden, AL 35904
205-547-2534

ALASKA

COMPUTER SOLUTIONS
P.O. Box 1727
Juneau, AK 99802
907-586-1844

KLOPF WORKS
SR 51367
Fairbanks, AK 99701
907-452-8502

ARIZONA

ANCRONA
4518 E. Broadway
Tucson, AZ 85711
602-881-2348

COMMERCIAL & HOME SYS.
7840 E. Broadway #113
Tucson, AZ 85710
602-886-6850

COMPUTERLAND
3152 E. Camelback Rd.
Phoenix, AZ 85016
602-956-5724

EVANS NEWTON
E. Butherus Drive #P
Scottsdale, AZ 85260
602-991-3258

MILLET'S ELECTRONIC
621 E. Broadway
Mesa, AZ 85204
602-964-1600

ARKANSAS

COMPUTERLAND
11121 Rodney Parham Rd.
Little Rock, AR 72212
501-224-4508

COMPUTER PRODUCTS UNLMTD.
2412 Broadway
Little Rock, AR 72206
501-371-0449

DATA SHOPPE, INC.
238 Central Mall
Ft. Smith, AR 72903
501-452-4948

DATA SHOPPE, INC.
1000-C E. Maine
Van Buren, AR 72956
501-474-8891

FNS COMPUTER SERVICES INC.
1911 N. Robison Rd.
Texarkana, AR 75501
214-832-5666

S.I.S. INC.
P.O. Box 1430
Conway, AR 72032
501-327-4471

CALIFORNIA

ACTIVE BUSINESS MACHINES
1148 Alpine Rd. Suite A
Walnut Creek, CA 94596
415-938-1230

ADVANCED COMPUTER PROD.
1310 E. Edinger, Unit B
Santa Ana, CA 92705
714-558-8813

ANCRONA CORPORATION
11080 Jefferson Blvd.
Culver City, CA 90230
213-390-3595

ANCRONA CORPORATION
6060 Manchester Ave.
Los Angeles, CA 90045
213-641-9322

ANCRONA CORPORATION
1300 E. Edinger Ave.
Santa Ana, CA 92705
714-547-8424

ANCRONA CORPORATION
1054 El Camino Real
Sunnyvale, CA 94087
408-243-4121

APPLE T.V.
2606 S. Robertson Blvd.
Los Angeles, CA 90034
213-559-4261

AWARD ASSOCIATES INC.
127 First St.
Ripon, CA 95366
209-527-0206

THE BASE STATION
2101 Pacheco St.
Concord, CA 94520
415-685-7388

BUSINESS ENHANCEMENT CORP.
1711 E. Valley Pkway 109
Escondido, CA 92027
714-741-6335

BYTE SHOP
1514 University Ave.
Berkeley, CA 94703
415-845-6366

BYTE SHOP
1812 W. Burbank Blvd.
Burbank, CA 91506
213-843-3633

BYTE SHOP
6041 Greenback Lane
Citrus Heights, CA 95610
916-961-2983

BYTE SHOP
1122 "B" Street
Hayward, CA 94541
415-537-2983

BYTE SHOP
16508 Hawthorne Blvd.
Lawndale, CA 90260
213-371-2421

BYTE SHOP
5453 E. Stearns St.
Long Beach, CA 90815
213-597-7771

BYTE SHOP
11611 San Vicente Blvd.
Los Angeles, CA 90049
213-820-1524

BYTE SHOP
1063 El Camino Real
Mt. View, CA 94040
415-969-5465

BYTE SHOP
2233 El Camino Real
Palo Alto, CA 94306
415-327-8080

BYTE SHOP
496 S. Lake Ave
Pasadena, CA 91101
213-684-3313

BYTE SHOP
123 Yorba Linda Blvd.
Placentia, CA 92670
714-524-5380

BYTE SHOP
1870 Fulton Ave.
Sacramento, CA 95822
916-481-3494

BYTE SHOP
8038 Clairemont Mesa Blvd.
San Diego, CA 92111
714-565-8008

BYTE SHOP
475 Sacramento St.
San Francisco, CA 94041
415-434-2983

BYTE SHOP
2626 Union Avenue
San Jose, CA 95124
408-377-4685

BYTE SHOP
986 Monterey St.
San Luis Obispo, CA 93401
805-543-9310

BYTE SHOP
509-B Francisco Blvd.
San Rafael, CA 94901
415-457-9311

BYTE SHOP
4 West Mission
Santa Barbara, CA 93101
805-966-2638

BYTE SHOP
3400 El Camino Real
Santa Clara, CA 93101
408-249-4221

BYTE SHOP
87 Alden St.
Suisun City, CA 94585
707-422-3515

BYTE SHOP
18424 Ventura Blvd.
Tarzana, CA 93156
213-343-3919

BYTE SHOP
2707 Thousand Oaks Blvd.
Thousand Oaks Blvd., CA 91360
805-497-9595

BYTE SHOP
674 El Camino Real
Tustin, CA 92680
714-544-4997

BYTE SHOP
1555 Morse Ave.
Ventura, CA 93003
805-647-8945

BYTE SHOP
2989 N. Main St.
Walnut Creek, CA 94596
415-933-6252

BYTE SHOP
14300 Beach Blvd.
Westminster, CA 92583
714-894-9131

CHANNEL DATA SYSTEMS
5960 Mandarin Ave.
Goleta, CA 93017
805-964-6695

COMPUTER AGE INC.
4688 Convoy St. #105
San Diego, CA 92111
714-565-4042

THE COMPUTER CORNER
1317 McHenry Ave.
Modesto, CA 95351
209-529-9967

COMPUTER FORUM
14052 E. Firestone Blvd.
Santa Fe Springs, CA 90670
213-921-2111

COMPUTERLAND
1625 El Camino Real
Belmont, CA 94002
415-595-4232

COMPUTERLAND
6743 Dublin Blvd.
Dublin, CA 94566
415-828-8090

COMPUTERLAND
2992 Navajo Road
El Cajon, CA 92020
741-464-5656

COMPUTERLAND
11074 San Pablo Ave.
El Cerrito, CA 94530
415-233-5010

COMPUTERLAND
22634 Foothill Blvd.
Hayward, CA 94542
415-538-8080

COMPUTERLAND
6840 La Cienega Blvd.
Inglewood, CA 90302
213-776-8080

COMPUTERLAND
16720 S. Hawthorne Blvd.
Lawndale, CA 90260
213-371-7144

COMPUTERLAND
4546 El Camino Real
Los Altos, CA 94022
415-941-8154

COMPUTERLAND
24001 Via Fabricante
Mission Viejo, CA 92691
714-770-0131

COMPUTERLAND
81 North Lake Street
Pasadena, CA 91101
213-449-3205

COMPUTERLAND
289 E. Highland Ave.
San Bernardino, CA 92404
714-886-6838

COMPUTERLAND
4233 Convoy St.
San Diego, CA 92111
714-560-9912

COMPUTERLAND
117 Fremont St.
San Francisco, CA 94105
415-546-1592

COMPUTERLAND
1077 Saratoga Svale Road
San Jose, CA 95129
408-253-8080

COMPUTERLAND
1930 4th Street
San Rafael, CA 94901
415-459-1767

COMPUTERLAND
611 Fifth St.
Santa Rosa, CA 95404
707-528-1775

COMPUTERLAND
171 E. Thousand Oaks Blvd.
Thousand Oaks, CA 91360
805-495-3554

COMPUTERLAND
104 W. First St.
Tustin, CA 92680
714-544-0542

COMPUTERLAND
1815 Ygnacio Valley Rd.
Walnut Creek, CA 94598
415-935-6502

COMPUTER PATHWAYS
12050 Nevada City Hway #100
Grass Valley, CA 95945

COMPUTER PLACE
2539 W. Sepulveda Blvd.
Torrance, CA 90505
213-325-4754

THE COMPUTER STORE
820 Broadway
Santa Monica, CA 90401
213-451-0713

COMPUTER TIMESHARING CORP.
5560 Ruffin Rd.
San Diego, CA 92123
714-565-0505

COMPUTERS UNLIMITED
6840 La Cienega Blvd.
Inglewood, CA 90302
213-776-8080

COMPUTER WORLD INC.
3808 W. Verdugo Ave.
Burbank, CA 91505
213-848-5521

COMPUTER WORLD INC.
5848 Sepulveda Blvd.
Van Nuys, CA 91411
213-786-7411

COMPUTER WORLD INC.
6789 Westminster Ave.
Westminster, CA 92683
714-898-8330

DATA EQUIPMENT SUPPLY
8315 Firestone Blvd.
Downey, CA 90241
213-923-9361

GRASS VALLEY COMPUTER
18430 Jayhawk Dr.
Smartville, CA 95977
916-272-2793

JAY-KERN ELECTRONICS
1013 Columbus
Bakersfield, CA 93305
805-834-6714/805-871-5800

K-SMITH ASSOCIATES
11 Mast Court
Sacramento, CA 95831
916-392-0317

KAROL MUSIC
1515 S. Broadway
Santa Maria, CA 93454
805-922-8265

LANTOR, INC.
8055 Manchester Ave.
Playa Del Rey, CA 90291

LYON TELEVISION
19515 Village Dr.
Sonora, CA 95370
209-532-4894

MATTHEWS TV & STEREO
6400 Mission St.
Daly City, CA 94014
415-992-5400

MATTHEWS TV & STEREO
214 California St.
San Francisco, CA 94104
415-781-0200

MR. CALCULATOR
39 Town & Country Village
Palo Alto, CA 94301
415-328-0740

INT'L INST. NAT'L HEALTH
7422 Mountjoy
Huntington Beach, CA 92647
714-848-0774/
Outside Calif. 800-854-1897

MR. CALCULATOR
55 Third St.
San Francisco, CA 94108
415-543-1541

MR. CALCULATOR
318 Town & Country Village
San Jose, CA 95128
408-246-5710

OLSON ELECTRONICS
11332 E. South St.
Cerritos, CA 90701
213-860-0060

OLSON ELECTRONICS
401 Parkway Plaza
El Cajon, CA 92020
714-440-0233

OLSON ELECTRONICS
4642 W. Century Blvd.
Inglewood, CA 90304
213-674-5740

OLSON ELECTRONICS
4840 Convoy St.
San Diego, CA 92111
714-292-1100

OLSON ELECTRONICS
2519 El Cajon Blvd.
San Diego, CA 92104
714-297-2946

OLSON ELECTRONICS
1329 S. Main St.
Santa Ana, CA 92707
714-541-6673

OLSON ELECTRONICS
2125 El Camino Real
Santa Clara, CA 95051
408-248-4886

PARADYME CONSUMER ELEC.
404 Second St.
Davis, CA 95616
916-758-5210

PC COMPUTERS
10166 San Pablo Ave.
El Cerrito, CA 94530
415-527-6657

PROGRAMMABLE ELECTRONIC
1748 W. Chapman Ave.
Orange, CA 92668
714-997-2280

RADIO MART
1075 Cypress Ave.
Redding, CA 96001
916-241-3000

COLORADO

AMPTEC
2310 Providence Circle
Colorado Springs, CO 80909
303-597-5384

AMPTEC
5975 N. Broadway
Denver, CO 80216
303-571-0833

BYTE SHOP
300 E. Foothills Pkway
Ft. Collins, CO 80525
303-223-4000

BYTE SHOP
3101 Walnut St.
Boulder, CO 80301
303-444-6550

BYTE SHOP
1st Ave. & University
Denver, CO 80206
303-399-8995

COMPUTERLAND
4543 Templeton Gap Road
Colorado Springs, CO 80909
303-574-4150

COMPUTERLAND
2422 S. Colorado Blvd.
Denver, CO 80222
303-759-4685

MICRO COMPUTER INDUSTRIES
1532 E. Mulberry
Ft. Collins, CO 80521
303-221-1955

COMMODORE BUSINESS MACHINES, INC.

Authorized Dealers

MICRO WORLD ELECTRONIX
6340 W. Mississippi
Lakewood, CO 80226
303-936-4407

NEIGHBORHOOD COMPUTER ST.
13045 W. Alameda Parkway
Lakewood, CO 80228
303-988-9140

CONNECTICUT

COMPUTERLAND
1700 Post Rd. Heritage Sq.
Fairfield, CT 06430

COMPUTER WORKS INC.
1439 Post Road East
Westport, CT 06880
203-255-9096

MULTI BUSINESS COMP. SYS.
28 Marlborough St.
Portland, CT 06480
203-342-2747/203-247-5937

DELAWARE

COMPUTERLAND
Astro Shopping Center
Newark, DE 19771
302-738-9656

WASHINGTON D.C.

COMPUTER EMPORIUM
1725 K Street N.W.
Washington D.C. 20006
202-466-2230

I.M.R. SYSTEMS CORP.
1705 Desales St. N.W.
Washington D.C. 20036
202-466-3330

FLORIDA

ACCURATE COMPUTING SERVICE
765 N. Lake Blvd.
North Palm Beach, FL 33408
305-842-4900

BYTE SHOP
P.O. Box 443
Cocoa Beach, FL 32931
305-784-1881

BYTE SHOP
1044 E. Oakland Park
Ft. Lauderdale, FL 33334
305-784-1881

BYTE SHOP
7825 Bird Rd.
Miami, FL 33155
305-264-2983

COMPUTER CENTER
6578 Central Ave.
St. Petersburg, FL 33707
813-343-1396

COMPUTERLAND
500 E. Spanish River Blvd.
Boca Raton, FL 33432
305-368-1122

COMPUTERLAND
3963 North Federal Hway
Ft. Lauderdale, FL 33308
305-566-0776

COMPUTERLAND
2777-6 University Blvd.
Jacksonville, FL 32217
904-731-2471

COMPUTERS FOR YOU
3608 Broward Blvd.
Ft. Lauderdale, FL 33312
305-581-8945

FLORIDA BOOK STORE
1614 W. University Ave.
Gainesville, FL 32604
904-376-6066

FOCUS SCIENTIFIC
1601 Biscayne Blvd.
Miami, FL 33132
305-358-3948

OLSON ELECTRONICS
5833 Ponce De Leon Blvd.
Coral Gables, FL 33146
305-566-7819

OLSON ELECTRONICS
2808 N. Federal Highway
Ft. Lauderdale, FL 33306
305-566-7819

OLSON ELECTRONICS
40 W. 49th St.
Hialeah, FL 33012
305-823-1600

OLSON ELECTRONICS
2318 Hollywood Blvd.
Hollywood, FL 33020
305-925-7272

OLSON ELECTRONICS
1644 N.E. Second Ave.
Miami, FL 33132
305-374-4121

OLSON ELECTRONICS
6901 22nd Ave. N.
St. Petersburg, FL 33710
813-345-9119

OLSON ELECTRONICS
1215 S. Dale Mabry Hway
Tampa, FL 33609
813-253-3129

ORLANDO ELECTRONICS CO.
2356 W. Oak Ridge Road
Orlando, FL 32809
305-855-1210

PROFIT CONCEPTS, INC.
9189 S. Hampton Place
Boca Raton, FL 33434
305-482-7818

TOMAR FITNESS SYSTEMS
P.O. Box 1016
Lake Helen, FL 32744

GEORGIA

ACTION BUSINESS MACHINES
1684 N. Atwood Dr.
Macon, GA 31204
912-474-3333

ANCRONA
3330 Peidmont Rd.
Atlanta, GA 30305
404-261-7100

ATLANTA COMPUTER MART
5091-B Buford Highway
Atlanta, GA 30340
404-455-0647

AUTOMATED ANSWERING SYS.
3482 Oak Cliff Road
Doraville, GA 30340

COMPUTERLAND
2423 Cobb Parkway
Smyrna, GA 30080
404-953-0406

THE LOGIC STORE
3050 Macon Road
Columbus, GA 31906
404-568-0197

MERCHANT'S BUS. MCHNS.
18 Executive Dr. N.E.
Atlanta, GA 30329
404-633-1027

OLSON ELECTRONICS
3131 Campbellton Rd.
Atlanta, GA 30311
404-349-3628

OLSON ELECTRONICS
2571 N. Decatur Road
Decatur, GA 30033
404-378-4201

PERIMETER
6950 Peachtree Ind. Blvd.
Suite F, Gateway Ind. Park
Norcross, GA 30071

HAWAII

COMPUTERLAND
567 S. King St.
Honolulu, HI 96813
808-521-8002

IDAHO

ELECTRONIC SPECIALTIES
8411 Fairview Ave.
Boise, ID 83704
208-376-5040

WORLD TOY & HOBBYCRAFT
7820 Fairview Ave.
Boise, ID 83704
208-378-3561/208-376-2438

ILLINOIS

APPLETREE STEREO
1022 W. Lincoln Hway
Dekalb, IL 60115
815-758-2442

APPLETREE STEREO INC.
117-119 E. Beaufort St.
Normal, IL 61761
309-452-4215

APPLETREE STERÉO INC.
1645 N. Alpine
Rockford, IL 61107
815-226-9826

BYTE SHOP
5 S. Lagrange Road
Lagrange, IL 60525
312-579-0920

BYTE SHOP
1602 S. Neil St.
Urbana, IL 61820
217-352-2323

COMPUTERLAND
50 E. Rand Rd.
Arlington Heights, IL 60004
312-255-6488

COMPUTERLAND
136 W. Ogden Ave.
Downers Grove, IL 60515
312-964-7762

COMPUTERLAND
9511 N. Milwaukee Ave.
Niles, IL 60648
312-967-1714

COMPUTERLAND
10935 S. Cicero Ave.
Oak Lawn, IL 60453
312-422-8080

COMPUTERLAND
4507 N. Sterling
Peoria, IL 61614
309-688-6252

COMPUTERLAND
1500 S. Lake St.
Mundelein, IL 60060
312-949-1300

FINANCIAL DYNAMICS
530 Park Ave.
River Forest, IL 60305
312-771-5444

KAPPEL'S COMPUTER STORE
125 E. Main St.
Belleville, IL 62220
618-277-2354

LILLIPUTE COMPUTER MART
4446 Oakton St.
Skokie, IL 60076
312-674-1383

OLSON ELECTRONICS
4101 N. Milwaukee Ave.
Chicago, IL 60641
312-545-7336

OLSON ELECTRONICS
123 North Western Ave.
Chicago, IL 60612
312-421-3533

OLSON ELECTRONICS
2641 West 95th Street
Chicago, IL 60642
312-425-6192

OLSON ELECTRONICS
1734 Ogden Ave.
Downers Grove, IL 60515
312-852-9650

OLSON ELECTRONICS
721 W. Golf Road
Hoffman Estates, IL 60172
312-882-7330

OLSON ELECTRONICS
1354 Winston Plaza
Melrose Park, IL 60160
312-344-6200

OLSON ELECTRONICS
6231 Dempster St.
Morton Grove, IL 60053
312-966-6700

ORCUTT BUSINESS MACHINES
431 - First Street
Lasalle, IL 61301
815-224-2774

PERSONAL COMPUTER
59 E. Lake Street
Chicago, IL 60601
312-337-6744

RUHL & ASSOCIATES
24 W. Stevenson
Freeport, IL 61032
815-235-7845

STEREOTRONIC INDUSTRIES
Wadsworth Rd. & North Ave.
Zion, IL 60099
312-336-2222

INDIANA

AUDIO SPECIALISTS
415 N. Michigan
South Bend, IN 46601
219-234-5001

BYTE SHOP
8077 Bramwood Court
Indianapolis, IN 46250
317-842-2983

COMMUNICATIONS ELECTRONIC
2204 Grand Ave.
Connersville, IN 47331
317-825-6893

THE COMPUTER CENTER
19819 Orchard St.
South Bend, IN 46637
219-272-0252

FT. WAYNE ELECTRONICS
4201 Coldwater Rd.
Ft. Wayne, IN 46805
219-483-3155

FT. WAYNE ELECTRONICS
3606 E. Maumee Ave.
Ft. Wayne, IN 46803
219-423-3433

FT. WAYNE ELECTRONICS
3606 Maumee Ave.
Ft. Wayne, IN 46803
219-423-3422

GRAHAM ELECTRONIC SUPPLY
23rd and Columbus
Anderson, IN 46014
317-644-3381

GRAHAM ELECTRONIC SUPPLY
10202 E. Washington St.
Indianapolis, IN 46204
317-899-4110

GRAHAM ELECTRONIC SUPPLY
133 S. Pennsylvania St.
Indianapolis, IN 46204

GRAHAM ELECTRONIC SUPPLY
408 North St.
Lafayette, IN 47902
317-742-4006

GRAHAM ELECTRONIC SUPPLY
Tippecanoe Mall
Sagamore Parkway East
Lafayette, IN 47905
317-447-9756

GRAHAM ELECTRONIC SUPPLY
222 N. Madison St.
Muncie, IN 47305
317-288-8837

OLSON ELECTRONICS
5353 N. Keystone
Indianapolis, IN 46220

STEWART BUSINESS MACHINES
4778 Broadway
Gary, IN 46408

IOWA

THE COMPUTER CENTER
302 Commercial
Waterloo, IO 50701
219-272-0252

THE MEMORY BANK
4128 Brady St.
Davenport, IO 52806
319-386-3330

KANSAS

BYTE SHOP
5815 Johnson Drive
Mission, KS 66202
913-432-2983

CENTRAL OFFICE SYSTEMS
307 N. Main
Hutchinson, KS 67501
316-663-5121

COMPUTERLAND
10049 Santa Fe Dr.
Overland Park, KS 66212
913-492-8882

COMPUTER VIDEO ROOM
7105 W. 105th St.
Overland Park, KS 66212
913-648-7105

MAIN ELECTRONICS
225 Ida
Wichita, KS 67211
316-267-3581

PERSONAL COMPUTER CENTER
3819 W. 95th St.
Overland Park, KS 66026
913-649-5942

KENTUCKY

BARNEY MILLER'S INC.
232 E. Main St.
Lexington, KY 40507
606-252-2216

COMPUTERLAND
813 E. Lyndon Lane
Louisville, KY 40222
502-587-8099

MICROTECH INC.
1127 S. 6th St.
Louisville, KY 40203
502-587-8099

OLSON ELECTRONICS
117 Southland Dr.
Lexington, KY 40503
606-278-9413

OLSON ELECTRONICS
4137 Shelbyville Rd.
Louisville, KY 40207
502-893-2562

LOUISIANA

COMPUTER PLACE
3340 Highland Rd.
Baton Rouge, LA 70821
504-387-0072

THE COMPUTER PLACE
1904 Pinnook Rd., Suite 202
Lafayette, LA 70508

COMPUTER SHOPPE
12A West Bank Expway
Gretna, LA 70053
504-366-0687

COMPUTER SHOPPE INC.
3225 Danny Park
Metairie, LA 70002
504-454-6600

FREEMAN ELECTRONICS
708 N. 7th St.
West Monroe, LA 71291
318-388-2312

VIDEO SPECTRUM
6601 Veterans Memorial Blvd.
Metairie, LA 70003
504-885-6527

MAINE

C.N.A.
37 High St.
Lewiston, ME 04240
207-784-6961

MARYLAND

COMPUTERLAND
16065 Frederick Rd.
Rockville, MD 20855
301-948-7676

COMPUTERS ETC.
13A Allegheny Ave.
Towson, MD 21204
301-296-0520

MAC'S MERCHANDISE MART
7140 Fairbrook Rd.
Baltimore, MD 21207
301-298-0473

THE MATH BOX INC.
2621 University Blvd. W.
Wheaton, MD 20902
301-833-6555

YOUR OWN COMPUTER LTD.
10678 Campus Way South
Largo, MD 20870
301-350-6680

MASSACHUSETTS

COMPUTERLAND
214 Worcester St.
Wellesley, MA 02181
617-235-6252

COMPUTER SHOP 11000011
288 Norfolk St.
Cambridge, MA 02139
504-454-6600

C.P.U. SHOP
39 Pleasant St.
Charlestown, MA 02129
617-242-3350

I.A.C. LIMITED
141 Addison
Boston, MA 02128
617-567-2517

NEW ENGLAND ELECTRONICS
679 Highland Ave.
Needham, MA 02192
617-449-1760

OLSON ELECTRONICS
817-821 Boylston
Boston, MA 02116
617-267-4700

OLSON ELECTRONICS
Hanover Mall
Hanover, MA 02339
617-826-5196

OLSON ELECTRONICS
North Shore Shopping Center
Peabody, MA 01960
617-532-0800

RETAIL COMPUTER CENTER
455 Center St.
Ludlow, MA 01056
413-589-0106

THE SOUND COMPANY
Fairfield Mall
Chicopee, MA 01020
413-593-5330

THE SOUND COMPANY
447 Sumner Ave.
Springfield, MA 01108
417-736-3626

THE SOUND COMPANY
The Westfield Shop
Westfield, MA 01085
413-568-1160

MICHIGAN

THE COMPUTER CENTER
28251 Ford Rd.
Garden City, MI 48135
313-422-2570

COMPUTER HOUSE
1407 Clinton Rd.
Jackson, MI 49202
517-783-5343

COMPUTERLAND
2927-28th St. S.E.
Kentwood, MI 48508
616-942-2931

COMPUTERLAND
301 South Livernois
Rochester, MI 48063
313-652-9000

COMPUTERLAND
29763 Northwestern Highway
Southfield, MI 48034
313-356-8111

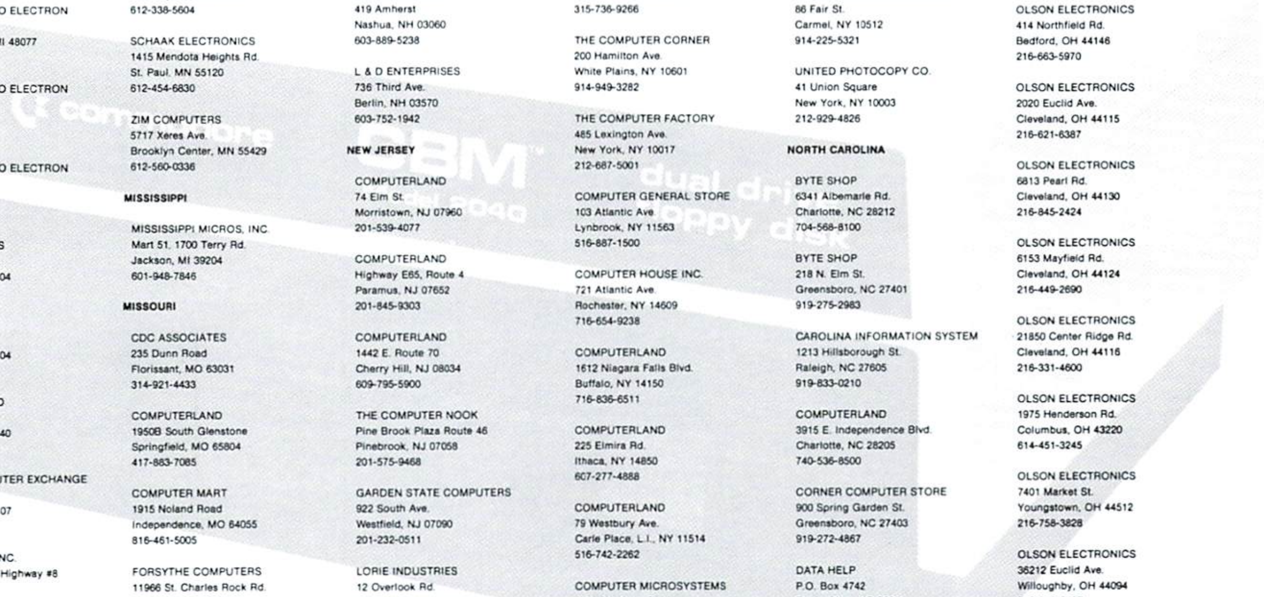
COMPUTERMART OF ROYAL OAK
560 W. 14 Mile Rd.
Clawson, MI 48017
313-288-0040

COMPUTRONIX CORP.
423 Saginaw Rd.
Midland, MI 48640
517-631-8060

ERIC ELECTRONICS
10721 W. Ten Mile Rd.
Oak Park, MI 48237
313-547-0203

LAFAYETTE RADIO ELECTRON
3430 Washtenaw
Ann Arbor, MI 48104
313-971-5420

Authorized Dealers



LAFAYETTE RADIO ELECTRON
1326 Broadway
Detroit, MI 48226
313-961-2955

LAFAYETTE RADIO ELECTRON
1375 E. Grand River Ave.
East Lansing, MI 48823
517-332-8676

LAFAYETTE RADIO ELECT
29400 Orchard Lake Rd.
Farmington, MI 48024
313-626-4595

LAFAYETTE RADIO ELECTRON
3142 28th St.
Grand Rapids, MI 49508
616-949-8590

LAFAYETTE RADIO ELECTRON
214 N. Rose St.
Kalamazoo, MI 49006
616-381-5164

LAFAYETTE RADIO ELECTRON
33760 Plymouth Rd.
Livonia, MI 48150
313-261-0600

LAFAYETTE RADIO ELECTRON
31873 Gratiot
Roseville, MI 48066
313-294-8000

LAFAYETTE RADIO ELECTRON
34208 Van Dyke
Sterling Heights, MI 48077
313-268-8550

LAFAYETTE RADIO ELECTRON
3127 W. Huron
Pontiac, MI 48054
313-681-7400

LAFAYETTE RADIO ELECTRON
3460 West Road
Trenton, MI 48183
313-675-7900

LASER DYNAMICS
101 W. Liberty
Ann Arbor, MI 48104
313-994-3667

MATRIX INC.
1241 N. Main
Ann Arbor, MI 48104
313-663-6677

NATIONAL MICRO
1095 Third St.
Muskegon, MI 49440
616-722-2929

NEWMAN COMPUTER EXCHANGE
1250 N. Main St.
Ann Arbor, MI 48107
313-994-3200

MAIN SYSTEMS INC.
1161 N. Ballenger Highway #8
Flint, MI 48504
313-232-3130

OLSON ELECTRONICS
15847 Southfield Rd.
Allen Park, MI 48101
313-388-9150

OLSON ELECTRONICS
1990 Woodward Ave.
Bloomfield Hills, MI 48013
313-334-4759

OLSON ELECTRONICS
15620 Grand River Ave.
Detroit, MI 48227
313-838-0777

OLSON ELECTRONICS
14243 Gratiot
Detroit, MI 48205
313-372-1317

OLSON ELECTRONICS
19045 Middlebelt Rd.
Livonia, MI 48152
313-477-0280

OLSON ELECTRONICS
29121 DeQuindre
Madison Heights, MI 48071
313-546-0190

OLSON ELECTRONICS
37627 Gratiot Ave.
Mt. Clemens, MI 48043
313-463-7074

OLSON ELECTRONICS
200 N. Wayne Rd.
Westland, MI 48185
313-722-3440

TRI-CITIES COMPUTER MART
3145 Shattuck Rd.
Saginaw, MI 48603
517-790-1360

MINNESOTA

COMPUTER DEPOT
3615 W. 70th St.
Minneapolis, MN 55436
612-927-5601

COMPUTERLAND
8070 Morgan Circle Dr.
Bloomington, MN 55431
612-884-1474

DIGITAL DEN
1009 Maplewood Mall
Maplewood, MN 55109
612-770-3975

JOHNSON RIC SALES
1325-97th Ave. N.W.
Coon Rapids, MN 55433
612-755-7037

MINNESOTA MICRO SYSTEMS
514 Cedar Avenue South
Minneapolis, MN 55454
612-338-5604

SCHAAK ELECTRONICS
1415 Mendota Heights Rd.
St. Paul, MN 55120
612-454-6830

ZIM COMPUTERS
5717 Xeres Ave.
Brooklyn Center, MN 55429
612-560-0336

MISSISSIPPI

MISSISSIPPI MICROS, INC.
Mart 51, 1700 Terry Rd.
Jackson, MI 39204
601-948-7846

MISSOURI

CDC ASSOCIATES
235 Dunn Road
Florissant, MO 63031
314-921-4433

COMPUTERLAND
1950B South Glenstone
Springfield, MO 65804
417-883-7085

COMPUTER MART
1915 Noland Road
Independence, MO 64055
816-461-5005

FORSYTHE COMPUTERS
11966 St. Charles Rock Rd.
Bridgeton, MO 63044
314-739-8300

GATEWAY ELECTRONICS
8123-25 Page Blvd.
St. Louis, MO 63130
314-427-6116

PARSONS ELECTRONICS
1059 Venture Dr.
St. Louis, MO 63301
314-723-2227

MONTANA

BYTE SHOP
1201 Grand Ave. Suite 3
Billings, MT 59102
406-252-2299

THE COMPUTER STORE
1216 — 16th. St. W. #35
Billings, MT 59102
406-245-0092

VARITRON
729 Indiana St.
Chinook, MT 59523
406-357-2116

NEBRASKA

AMERICAN COMPUTERS
4442 S. 84th
Omaha, NE 68127
402-592-1518

BYTE SHOP
8523 Park Drive
Omaha, NE 68127
402-339-7350

COMPUTERLAND
11031 Elm St.
Omaha, NE 68144
402-391-6716

OMAHA COMPUTER STORE
4540 S. 84th St.
Omaha, NE 68127
402-592-3590

NEVADA

BYTE SHOP
4104 S. Kietzke Lane
Reno, NV 89502
702-826-8080

HOME COMPUTERS
1775 Tropicana
Las Vegas, NV 89109
702-736-6363

INGENUITY INC.
1562 Linda Way
Sparks, NV 89431
702-359-6671

NEW HAMPSHIRE

COMPUTERLAND
419 Amherst
Nashua, NH 03060
603-889-5238

L & D ENTERPRISES
736 Third Ave.
Berlin, NH 03570
603-752-1942

NEW JERSEY

COMPUTERLAND
74 Elm St.
Morristown, NJ 07960
201-539-4077

COMPUTERLAND
Highway E65, Route 4
Paramus, NJ 07652
201-845-9303

COMPUTERLAND
1442 E. Route 70
Cherry Hill, NJ 08034
609-795-5900

THE COMPUTER NOOK
Pine Brook Plaza Route 46
Pinebrook, NJ 07058
201-575-9468

GARDEN STATE COMPUTERS
922 South Ave.
Westfield, NJ 07090
201-232-0511

LORIE INDUSTRIES
12 Overlook Rd.
Rochelle Place, NJ 07662
201-843-0020

MEDIA SOFTWARE
372 Highcrest Dr.
West Milford, NJ 07480

MELAD ASSOCIATES
P.O. Box 159
Milltown, NJ 08850

S.S. COMPUTER ENTERPRISES
224 E. Madison Ave.
Cresskill, NJ 07626
201-567-8076

SMI, Inc.
600 Washington Ave.
Carlstadt, NJ 07072
201-939-4800

STONEHENGE COMPUTER CO.
89 Summit Ave.
Summit, NJ 07901
201-277-1020

THOR ELECTRONICS CORP.
321 Pennsylvania Ave.
Linden, NJ 07036
201-486-3300

NEW MEXICO

OMEGA OFFICE PRODUCTS
3100 Richland N.E.
Albuquerque, NM 87113
505-345-4545

NEW YORK

AMERICAN PERIPHERALS
3 Bangor St.
Lindenhurst, NY 11747
516-587-2615

APOLLO DISTRIBUTORS
39 Woodland
Farmingdale, NY 11735
516-420-8642

A.S.D. OFFICE SYSTEMS
Van Wyck Plaza
Poughkeepsie, NY 12603
914-473-9400

B C COMMUNICATIONS
207 Depot Rd.
Huntington Station, NY 11746
516-549-8833

BITS & BYTES
2800 Straight Rd.
Fredonia, NY 14063
716-673-1682

BYTE SHOP
2721 Hempstead Turnpike
Levittown, NY 11756
516-731-8116

COMPUTER CONNECTION CORP.
8609 Aitken Ave.
Whitesboro, NY 13492
315-736-9266

THE COMPUTER CORNER
200 Hamilton Ave.
White Plains, NY 10601
914-949-3282

THE COMPUTER FACTORY
485 Lexington Ave.
New York, NY 10017
212-687-5001

COMPUTER GENERAL STORE
103 Atlantic Ave.
Lynbrook, NY 11563
516-887-1500

COMPUTER HOUSE INC.
721 Atlantic Ave.
Rochester, NY 14609
716-654-9238

COMPUTERLAND
1612 Niagara Falls Blvd.
Buffalo, NY 14150
716-836-6511

COMPUTERLAND
225 Elmira Rd.
Ithaca, NY 14850
607-277-4888

COMPUTERLAND
79 Westbury Ave.
Carle Place, L.I., NY 11514
516-742-2262

COMPUTER MICROSYSTEMS
1311 Northern Blvd.
Manhasset, NY 11030
516-627-3640

COMPUTER SHOP OF SYRACUSE
3470 E. Erie Blvd.
Dewitt, NY 13214
315-446-1284

COMPUTER STRATEGIES INC.
300 N. Main St.
Spring Valley, NY 10977
914-356-7770

COMPUTER WORD INC.
422 Northern Blvd.
Great Neck, NY 11021
516-487-7830

COMPUTER WORLD
519 Boston Post Rd.
Port Chester, NY 10573
914-937-6662

HONDERS INC.
Kenil Rd.
Cuddybackville, NY 12729
914-754-7106

LOGICAL PLAYBACK
10 Grace Ave.
Great Neck, NY 11021
212-624-9075

MEIZNER BUSINESS MACHINES
24 Lorraine Ave.
Mt. Vernon, NY 10553
914-699-7210

MR. COMPUTER
Imperial Plaza
Wappingers Fall, NY 12590
914-297-1223

N.Y. ASTROLOGY BOOK STORE
127 Madison Ave.
New York, NY 10016
212-679-5676

OLSON ELECTRONICS
711 Main St.
Buffalo, NY 14203
716-856-2504

OLSON ELECTRONICS
3259 Sheridan Dr.
Buffalo, NY 14226
716-837-6300

OLSON ELECTRONICS
4401 Transit Rd.
Buffalo, NY 14221
716-633-6644

OLSON ELECTRONICS
3768 Seneca St.
West Seneca, NY 14224
716-675-4330

QUBE INTERNATIONAL
4665 Beach Ridge
Lockport, NY 14094

SECURITY SYSTEMS INSTLRS
86 Fair St.
Carmel, NY 10512
914-225-5321

UNITED PHOTOCOPY CO.
41 Union Square
New York, NY 10003
212-929-4826

NORTH CAROLINA

BYTE SHOP
6341 Albemarle Rd.
Charlotte, NC 28212
704-568-8100

BYTE SHOP
218 N. Elm St.
Greensboro, NC 27401
919-275-2983

CAROLINA INFORMATION SYSTEM
1213 Hillsborough St.
Raleigh, NC 27605
919-833-0210

COMPUTERLAND
3915 E. Independence Blvd.
Charlotte, NC 28205
740-536-8500

CORNER COMPUTER STORE
900 Spring Garden St.
Greensboro, NC 27403
919-272-4867

DATA HELP
P.O. Box 4742
Rocky Mtn., NC 27801
919-977-5517

OHIO

ASTRO VIDEO ELECTRONICS
504 E. Main St.
Lancaster, OH 43130
614-687-0629

BYTE SHOP
2432 Chester Lane
Columbus, OH 43221
614-586-7761

BYTE SHOP
19542 Center Ridge Rd.
Rocky River, OH 44016
216-333-3261

COMPUTERLAND
6429 Busch Rd.
Columbus, OH 43229
614-888-2215

COMPUTERLAND
1288 Som Center Rd.
Mayfield Heights, OH 44124
216-461-1200

COMPUTERLAND
4579 Great Northern Blvd.
North Olmsted, OH 44070
216-777-1433

DAYTON COMPUTER MART
2665 S. Dixie Ave.
Dayton, OH 45409
513-296-1248

GRAHAM ELECTRONICS SUPPLY
239 Northland Blvd.
Cincinnati, OH 45215
513-772-1661

INDUCTIVE COMPONENTS
1200 Ferris Rd.
Amelia, OH 45102
513-752-4731

MCSHANE INE.
123 W. Washington
Medina, OH 44256
216-725-4568

MICRO MINI COMPUTER WORLD
74 Robinwood Ave.
Columbus, OH 43213
614-235-5813

OLSON ELECTRONICS
69 W. State St.
Akron, OH 44308
216-762-0301

OLSON ELECTRONICS
1994 Brittain Rd.
Akron, OH 44310
216-633-4338

OLSON ELECTRONICS
3265 W. Market St. #108
Akron, OH 44313
216-864-3407

OLSON ELECTRONICS
414 Northfield Rd.
Bedford, OH 44146
216-663-5970

OLSON ELECTRONICS
2020 Euclid Ave.
Cleveland, OH 44115
216-621-6387

OLSON ELECTRONICS
6813 Pearl Rd.
Cleveland, OH 44130
216-845-2424

OLSON ELECTRONICS
6153 Mayfield Rd.
Cleveland, OH 44124
216-449-2690

OLSON ELECTRONICS
21850 Center Ridge Rd.
Cleveland, OH 44116
216-331-4600

OLSON ELECTRONICS
1975 Henderson Rd.
Columbus, OH 43220
614-451-3245

OLSON ELECTRONICS
7401 Market St.
Youngstown, OH 44512
216-758-3828

OLSON ELECTRONICS
36212 Euclid Ave.
Willoughby, OH 44094
216-946-5457

OLSON ELECTRONICS
1193 W. Pleasant Valley Rd.
Parma, OH 44134
216-888-6366

RADIO COMMUNICATIONS
1995 Marion-Bucyrus Rd.
Marion, OH 43302
614-382-4126

RIKE'S
1111 S. Miami Blvd. West
Dayton, OH 45401
513-225-8457

UNIVERSAL AMATEUR RADIO
1280 Aida Dr.
Reynoldsburg, OH 43068
614-866-4267

OKLAHOMA

AUDIO HORIZONS
3707 E. Frank Phillips
Bartlesville, OK 74003
918-333-7748

BRADFORD BROTHERS
507 S. Main
Tulsa, OK 74103
918-584-4558

COMPUTER SYSTEMS & SOFTWARE
928 N. York
Muskogee, OK 74403
918-687-3161

Authorized Dealers

COMPUTERLAND
10321 North May Ave.
Oklahoma City, OK 73120
405-755-5200

TEL-COM INC.
727 N. Brauer Ave.
Oklahoma City, OK 73106
405-232-2035

OREGON

ANCRONA
1125 N.E. 82nd Ave.
Portland, OR 97220
503-254-5541

COMPUTERLAND
12020 S.W. Main St.
Tigard, OR 97223
503-620-6170

COMPUTER PATHWAYS
2151 Davcor S.E.
Salem, OR 97302
503-363-8929

COMPUTER PATHWAYS
831 Lancaster Dr. N.E.
Salem, OR 97301
503-399-0534

PENNSYLVANIA

A.B. COMPUTERS
115 E. Stump Rd.
Montgomeryville, PA 18936
213-699-8386

BYTE SHOP
1045 W. Lancaster Ave.
Bryn Mawr, PA 19010
215-525-7712

CHIPS 'N DIP
4820 Anne Lane
Sharpsville, PA 16150
412-962-9682

COMPUTER AID
Latrobe 30 Shopping Plaza
Latrobe, PA 15650
412-539-1133

THE COMPUTER HOUSE
1000 Greentree Rd.
Pittsburgh, PA 15220
412-921-1333

COMPUTERLAND
4644 Carlisle Pike
Mechanicsburgh, PA 17055
717-763-1116

COMPUTERLAND
81 E. Lancaster Ave.
Paoli, PA 19301
215-296-0210

GLOSSER BROS.
Franklin & Locust Sts.
Johnstown, PA 15901
814-536-6633

GREY FOX ELECTRONICS
Main & Reliance
Telford, PA 18969
215-723-3831

MARKETLINE SYSTEMS
2337 Philmont Ave.
Huntingdon Valley, PA 19006
215-947-6670

MICRO COMPUTER APPLIC
806 Penn Ave.
Sinking Spring
Reading, PA 19608
215-670-1300

OLSON ELECTRONICS
5918 Penn Ave.
Pittsburgh, PA 15206
412-362-1333

OLSON ELECTRONICS
3405 Saw Mill Run Road
Pittsburgh, PA 15227
412-881-0702

OLSON ELECTRONICS
4778 McKnight Rd.
Pittsburgh, PA 15237
412-366-7298

PUERTO RICO

MARTINEZ MICROCOMPUTE
1568 Ave. Jesus T. Pinero
Caparra Terrace Rio Piedr
Puerto Rico 00921
809-781-0350

SOUTH CAROLINA

BYTE SHOP
1920 Blossom, Box 1544
Columbia, SC 29205
803-771-7824

SOUTH DAKOTA

COMPUTER PLACE, INC.
419 E. Railroad Ave.
Aberdeen, SD 57401
605-226-2667

TENNESSEE

BYTE SHOP
5613 Kingston Pike
Knoxville, TN 37919
615-584-8365

MICROSYSTEMS INC.
3100 Walnut Grove
Memphis, TN 38111
901-458-5985

TEXAS

ANCRONA
2649 Richmond Ave.
Houston, TX 77098
713-529-3489

BORDER ELECTRONIC SERVICE
1704 E. Paisano
El Paso, TX 79923
915-532-2524

COMPUTERLAND
3300 Anderson Lane
Austin, TX 78757
512-452-5701

COMPUTERLAND
8061 Walnut Hill Lane 912
Dallas, TX 75231
214-363-2223

COMPUTERLAND
17647 El Camino Real
Houston, TX 77058
713-488-8153

COMPUTERLAND
6439 Westheimer
Houston, TX 77057
713-977-0909

THE COMPUTER SHOP
6812 San Pedro
San Antonio, TX 78216
512-828-0553

COMPUTER SOLUTIONS INC.
Suite #7 6600 Sanger Ave.
Waco, TX 76710
817-772-3165

DALWORTH MICRO COMPUTERS
3103 Woodside Dr.
Arlington, TX 76016
817-429-7988

DATA SERVICES CO.
7401 Gulf Freeway #107
Houston, TX 77017

ECLECTIC SYSTEMS CORP.
16260 Midway Rd.
Addison, TX 75001
214-661-1370

FOLEY'S
1110 Maine
Houston, TX 77001
713-651-6070

KA ELECTRONIC SALES
9090 Stemmons Freeway
Dallas, TX 75247
214-634-7870

KA ELECTRONIC SALES
1117 S. Jupiter Rd.
Garland, TX 75042
214-494-2588

KENT ELECTRONICS
5626 Bon Homme Rd.
Houston, TX 77036
713-783-9800

SORT-DATA CORP.
P.O. BOX 3795
Byran, TX 77801

UTAH

ADP SYSTEMS
550 N. Main
Logan, UT 84321
801-753-6990

BYTE SHOP
261 S. State St.
Salt Lake City, UT 84111
801-355-1041

COMPUTER HUB
5899 S. State
Murray, UT 84107
801-262-5416

COMPUTERLAND
161 E. 2nd South
Salt Lake City, UT 84111
801-364-4416

THE COMPUTER WORKS
735 S. State St.
Provo, UT 84601
801-374-0204

THE HI-FI SHOP
2236 Washington Blvd.
Ogden, UT 84401
801-621-5244

THE HI-FI SHOP
4680 Holladay Blvd.
Salt Lake City, UT 84117
801-277-2629

MOBILITE COMPUTERS
337 W. 200 South
Salt Lake City, UT 84101
801-531-1567

VIRGINIA

COMPUTERLAND
8411 Old Courthouse Rd.
Vienna, VA 22180
703-893-0424

TYSONS COMPUTER EMPORIUM
1984 Chain Bridge Rd.
McLean, VA 22101
703-821-8333

RMS TECHNOLOGY INC.
706 Industry Dr.
Hampton, VA 23661
804-838-2458

SCIENTIFIC TRADING INC.
2990 Telestar Court #115
Falls Church, VA 22042
703-573-8787

WASHINGTON

AMERICAN MERCANTILE CO.
2418 First Ave. South
Seattle, WA 98134
206-624-6141

COMPUTERLAND
14340 N.E. 20th
Bellevue, WA 98007
206-746-2070

COMPUTERLAND
1500 S. 336th St. #12
Federal Way, WA 98003
206-838-9363

COMPUTERLAND
8791 S. Tacoma Way
Tacoma, WA 98449
206-581-0388

I.B.F.
South 1606 Progress
Veradale, WA 99037
509-955-4428

MICRO COMPUTER CENTER
11822 N.E. 8th St.
Bellevue, WA 98005
206-455-3710

OMEGA COMPUTERS
839 - 106th Ave. N.E.
Bellevue, WA 98004
206-454-0677

OMEGA COMPUTERS
5421 - 196th S.W.
Lynwood, WA 98036
206-775-7585

OMEGA COMPUTERS
1032 N.E. 65th
Seattle, WA 98004
206-522-0220

PERSONAL COMPUTERS INC.
South 104 Freya
Spokane, WA 99202
509-534-3955

WEST VIRGINIA

MARSHALL UNIV. BOOKSTORE
5th Ave. & Elm St.
Huntington, WV 25701
304-696-3622

WISCONSIN

BYTE SHOP
6019 W. Layton Ave.
Greenfield, WI 53220
414-281-7004

COLORTRON
2111 Lathrop Ave.
Racine, WI 53405
414-637-2003

COMPUTERLAND
690 S. Whitney Way
Madison, WI 53711
608-273-2020

COMPUTERLAND
10111 W. Capitol Dr.
Milwaukee, WI 53222
414-466-8990

MADISON COMPUTER STORE
1825 Monroe St.
Madison, WI 53711
608-255-5552

OLSON ELECTRONICS
3125 W. 108th St.
West Allis, WI 53227
414-541-1406

VISIT YOUR LOCAL COMMODORE DEALER
TO SEE OUR LATEST
COMPUTER PRODUCTS AND SOFTWARE

Part No. 321039-A

COMMODORE BUSINESS MACHINES, INC.

THREE WORD PROCESSORS:

A User Manual Of Reviews

Len Lindsay,
Senior Contributing Editor for
Commodore Products

I am presenting an overview of 3 word processors for the PET. In addition I am attempting a comparative evaluation. This is extremely difficult since they all do things differently. I am trying to show what each can do as well as what it doesn't do. You decide what you need and can afford, but please don't rely completely on this set of articles. Contact each company for their information and read it carefully.

What are some areas of major difference between the 3 word processors presented in this issue? One difference is how they are programmed. Commodore's is written completely in machine language. Machine language is much faster than Basic. Programma's and Connecticut Microcomputer's are written in BASIC. Therefore, you can change lines and modify each to suit your needs. This would include adding a section to save and load files on your disk, either Commodore's, Computhinks, or others.

Another major difference is how the word processor treats your text. Each is different. Connecticut Microcomputer's looks at your text as a series of consecutive lines. The lines can be moved, inserted, deleted & changed. Programma's looks at the text as a series of strings. These strings can be changed, have parts deleted or have more characters inserted, etc. Commodore's looks at your text as a series of characters. 23 lines of text are always displayed on the screen. It scrolls up & down as needed, while the cursor indicates your position within the text.

How about the manuals? Both Commodore and Connecticut Microcomputer provide good manuals with explanations of the various aspects of their programs. Programma's word processor is virtually self explanatory. It comes with a 1 page introduction. Further instructions are on the tape as a text file. Once you LOAD the program you INPUT the instructions from the tape. Other than explaining the use of 2 special function keys, instructions aren't needed, for the program asks for information when it's needed. It begins by asking what major function you wish to perform. If you are going to print your output it prompts you for information on margins, etc. In addition to their printed manual Commodore also includes their manual on the diskette following their word processor programs.

What about the price? Programma's is $19.95; Connecticut Microcomputer's is $29.50; and Commodores is $99.95. And how about a minimum system configuration needed to use the program? Both Programma's and Connecticut Microcomputer's work on the standard 8K PET with 1 cassette unit. A printer is not necessary since the finished text can be output on your screen. Commodores Word Processor II requires a 16K PET and at least 1 disk drive. The finished text can not be sent to the screen, so a printer is a necessity. However, you can compose your text without the printer.

An Overview

	COMMODORE WORD PRO. II	PROGRAMMA by RICHTER	CONN. MICROCOMP. WPP
PET 8K (OLD)	(VER 1)	YES	VER 1
PET 16K-32K (NEW)	VER 2	YES	VER 2
RS232 OUTPUT TO PRINTER	YES	YES	YES
OUTPUT TO CBM PRINTER	YES	YES	YES
COMPUTHINK DISK FILE STORAGE	NO	NO*	NO*
CBM DISK FILE STORAGE	YES	YES	NO*
FINAL TEXT OUTPUT TO EITHER SCREEN OR PRINTER	NO	YES	YES
AUTO REPEAT KEYS	YES	NO*	NO*
CENTER TEXT (i.e. Headings)	YES	NO	YES
SHIFT FOR UPPER CASE	YES	YES	YES
ALL CAPS LOCKS	YES	YES*	NO
VARIABLE SPACING (Single or Double...)	YES	YES	YES
LINE SPACING CHANGEABLE WITHIN ONE FILE	NO	NO	YES
TAB CONTROL	YES	1	NO
RIGHT JUSTIFY	YES	NO	VER 2
EDIT AVAILABLE	YES	YES	YES
DELETE	YES	YES	YES
INSERT	YES	YES	YES
SEARCH	YES	NO	VER 2
VARIABLE BLOCKS	YES	NO	NO
PAUSE	NO	NO	YES
SCROLLING TEXT (up or down)	YES	NO	NO
VARIABLE LINE LENGTH (margins)	YES	YES	YES
VARY LINE LENGTH WITHIN ONE TEXT	YES	NO	YES
BASIC OR MACHINE LANGUAGE	ML	B	B

*Routine may be added by user.

Each has its own advantages. Programma's is the simplest to operate. Connecticut Microcomputer's is most flexible in formatting your final output. It can print separate segments or the whole text. It can dynamically change its line length, spacing, etc. within the same text. Commodore's is enjoyable to use. You see your text move around; spaces open up for line insert, etc.

Next issue I will review more word processors, including Version 2 from Connecticut Microcomputer and 2 other versions from Commodore. Textcast will also be included, which is different from each of these covered this issue. TIS has a text editor which will be included and so will CURSOR's text editor. Computer Factory supposedly has a word processor, but I have not yet received a reply to my letter asking for information on it. Home Computer Center is supposed to release a word processor soon, hopefully in time to be included next issue. I ordered a word processor from England long ago, but haven't received it yet. If anyone has a word processor working on the PET, please contact me right away. I may even include a summary of CONTEXT as adapted for the PET from the Kilobaud article.

Send your comments, ideas, and suggestions directly to: Len Lindsay, 1929 Northport Dr., Room 6, Madison, WI 53704. I hope to hear from you. Since I get a lot of mail, please include a self-addressed stamped envelope if you would like a reply.

WORD PROCESSOR

$99.95

COMMODORE BUSINESS MACHINES, INC.
Palo Alto, CA

I have used every text editor or word processor for the PET that I could get ahold of. This word processor is by far the best. And Commodore will soon release an even more advanced word processor with more added features. I was fortunate to receive an advance copy of the preliminary version. I have used it for one month now, and I use it heavily, for word processing is my major use of my PET.

The Commodore Word Processor can be used with the PET or CBM models 2001-16 and -32, N or B version microcomputers, equipped with a Commodore model 2040 Dual Drive Floppy Disk and Commodore model 2022 or 2023 Matrix Printer. A separate version is also included for use with any ASCII printing device, such as a NEC Spinwriter.

The Commodore Word Processor is character oriented with direct cursor editing. It is extremely easy to use. I will try to cover its many features and commands in an overview.

The top two lines of the screen are reserved for STATUS indicators. These two lines indicate your cursor location by line and column numbers as well as other important information. The other 23 lines continually display the text you are working on. It can be scrolled both up and down using the CURSOR UP or CURSOR DOWN keys, and at an amazingly quick speed too. This scrolling speed can be increased to the point of a blur by hitting the CONTROL key before using the CURSOR UP or DOWN.

SHIFTING. All alphabetics are lower case, shift for upper case. The SHIFT LOCK key on the PET works as usual, shifting all the keys. In addition, the backslash key has been disabled and now functions as an ALL CAPS LOCK. This is different from the SHIFT LOCK in that it only shifts the 26 alphabetic keys. The numbers, for example, still come out numbers and are not shifted.

CONTROL KEY. The REV/OFF key has been deactivated and is now used as a CONTROL key. This allows commands to be issued such as CONTROL s to set a tab.

TEXT FILES. To either LOAD or SAVE a section of text press SHIFT and HOME/CLR. First you give the file name. When loading a file, you need not spell out the complete name but can take advantage of the 2040 disk's pattern matching routines. Next you specify whether to LOAD or SAVE that file (simply hit "S" or "L"). If you specify LOAD, you do not have to indicate from which drive, it searches both drives for the file. Of course for a SAVE you must specify which drive number. If you try to SAVE a file with a name that already exists on that drive, the program asks you if you wish to OVERWRITE the existing file or not. If you wish to overwrite it, simply hit "Y" for yes. This is handy for updating your files.

REPEAT. All non-letter keys are equipped with automatic fast REPEAT except the CONTROL key. It takes about 1 second to get from one side of the screen to the other with a repeating cursor key. Repeat is also very handy for use with the Delete and Insert keys.

TAB. You may tab over to the next set tab location by hitting SHIFT "arrow across" key. To set or clear a tab, place the cursor in the correct column and hit CONTROL "S" (to set) or CONTROL "C" (to clear). To clear all tabs hit CONTROL "K." Set tab positions are continually indicated by half boxes on the second status line over each column with a set tab. This is very convenient.

HOME. Hitting the HOME key takes you to the start of the text presently on your screen. Hitting it once more takes you to the very start of all text presently in memory, or column 1, line 1.

DELETE. Pressing the DELETE key will delete the character immediately preceding the present cursor position. Holding the key deletes entire strings. To delete an entire line at a time simply put the cursor at the start of the line and hit the CONTROL key then the DELETE key for each line to be deleted. To delete the remainder of a line simply hit RETURN. All text below a deleted section is moved up as necessary.

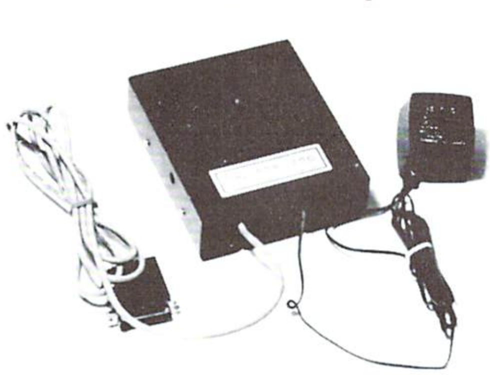
INSERT. The INSERT key functions as usual and repeats if held down. It pushes the entire paragraph over one space to the right beginning at the cursor position. If the paragraph runs out of expansion room all text beneath it is moved down one line. You may also enter INSERT MODE by pressing SHIFT and CONTROL. While in insert mode you may type in what you wish to insert and the text is moved as mentioned above to make room for each character as you enter them. The delete key still functions as usual. Press SHIFT and CONTROL again to return back to normal mode.

RETURN. The return key is graphically illustrated on the screen as a left ARROW ACROSS character. This character is not printed when formatted onto a page. The RETURN key deletes the remainder of the line you are on and puts the cursor on the first position of the next line. It is normally used only when you wish the printer to begin a new line, usually at the end of a paragraph or title. You do not hit RETURN after every sentence. This makes typing a paragraph much easier.

CENTER. Type a SHIFT COLON ":" (graphically illustrated as a check mark) at the beginning of any line you wish to be centered on the printed page. End the line with a RETURN. The formatter will automatically center the line within the margins when printed. You can center each line of a whole paragraph by preceding it with a SHIFT COLON and ending it with a RETURN.

SEARCH. The Editor will search through all text for any character, word, or phrase. Simply put the string you wish to search for on the first line. Then hit

PET Printer Adapter



The CmC ADA 1200 drives an RS-232 printer from the PET IEEE-488 bus. Now, the PET owner can obtain hard copy listings and can type letters, manuscripts, mailing labels, tables of data, pictures, invoices, graphs, checks, needlepoint patterns, etc., using RS-232 standard printer or terminal.

A cassette tape is included with software for plots, formatting tables and screen dumps. The ADA1200 sells for $169.00 and includes case, power supply and cable.

Order direct or contact your local computer store.

VISA AND M/C ACCEPTED — SEND ACCOUNT NUMBER, EXPIRATION DATE AND SIGN ORDER.
ADD $3 PER ORDER FOR SHIPPING & HANDLING — FOREIGN ORDERS ADD 10% FOR AIR POSTAGE

CONNECTICUT microCOMPUTER, Inc.
150 POCONO ROAD
BROOKFIELD, CONNECTICUT 06804
TEL: (203) 775-9659 TWX: 710-456-0052

CONTROL 'f.' The editor will place the cursor immediately after the first occurance of the search string. CONTROL 'f' will take you to the next occurance, etc. till the end of text.

COPY. Similar to the SEARCH function, the Editor can COPY the word or phrase that is on the first line anywhere you place the cursor and type CONTROL '*.' This saves the time of typing the same phrase or company name over many times.

ERASE. One can erase all the text by typing CONTROL 'e' followed by 'a' (for all). Typing CONTROL 'e' followed by 'r' erases all text after the cursor position.

MERGE. Text from a file on disk can easily be merged into the file you are presently working on. Simply place your cursor on the line where you wish to merge the new text. Then LOAD the new text.

MOVE. Whole sections of text can be moved from one place to another. This is helpful if you wish to rearrange your paragraph order.

HYPHENATION. Semi-automatic hyphenation is available. You just place a special hyphen symbol (shifted '@,' graphically displayed as a '-') where you would like the word hyphenated if need be. When printed the word will be hyphenated at that point if necessary, otherwise the hyphen will be ignored.

FORMATTING FUNCTIONS. When your text is formatted onto the printed page you have many print features to control. Line spacing is variable, single, double, or other. Margin release and indentation is handy to use. You can set both Right and Left margins. The nicest feature is the justification feature. You can have your printed copy justified both left and right.

APPEND. Since there are two distinct and separate text areas, you may compose lines or paragraphs in the alternate text area and number them. Later while writing your text you can call any of your previously defined lines by number. Thus you can have a disk of numbered paragraphs which you load into the alternate text area. These then can be called into your main text as you need them, in any order.

VARIABLE DATA BLOCKS. Here is a feature I was pleased with. You can have variables in your text. This is ideal for form letters. First compose the letter, leaving blank the name & address, and other variable info, such as amount of money owed, etc. Then in your alternate text area enter the name, address & other info needed, in the correct order as used in your main text. You can enter this info for more than just the first one. When done with the data for the first, simply begin the sequence again for the second, then the third, etc.

The variable data in your main text can be filled manually, semi-automatically, or automatically. Also, there is a special printing option which will print your main text and fill in the variable data as it goes. It will type one right after the other (hopefully you put in some page commands at the end of the letter).

PET Word Processor

8K
and
16/32K
PET
versions

CmC SOFTWARE
Word Processor Program

This program permits composing and printing letters, flyers, advertisements, manuscripts, etc., using the COMMODORE PET and a printer.

Printing directives include line length, line spacing, left margin, centering and skip. Edit commands allow you to insert lines, delete lines, move lines and paragraphs, change strings, save files onto and load files from cassette (can be modified for disk), move up, move down, print and type.

Added features for the 16/32K version include string search for editing, keyboard entry during printing for letter salutations, justification, multiple printing and more.

A thirty page instruction manual is included.

The CmC Word Processor Program for the 8K PET is $29.50. The 16/32K version is $39.50.

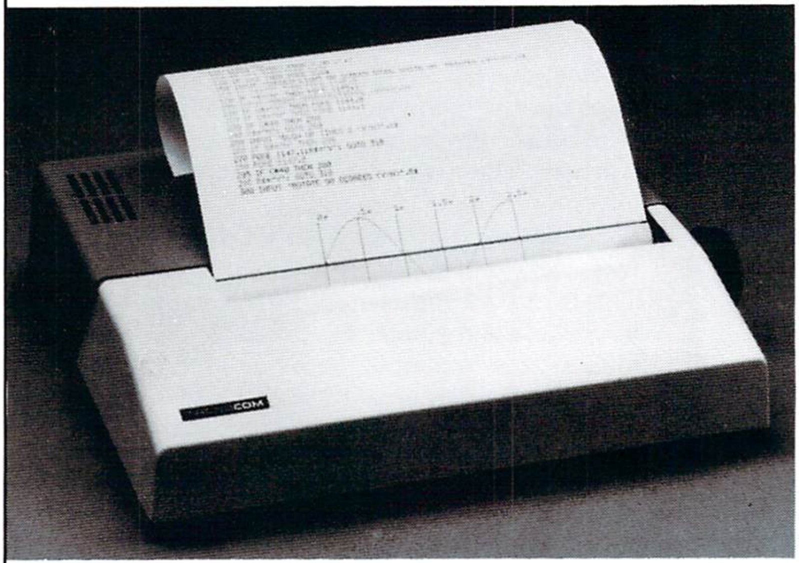
Order direct or contact your local computer store.

VISA AND M/C ACCEPTED — SEND ACCOUNT NUMBER, EXPIRATION DATE AND SIGN ORDER.
ADD $1 PER ORDER FOR SHIPPING & HANDLING — FOREIGN ORDERS ADD 10% FOR AIR POSTAGE

CONNECTICUT microCOMPUTER, Inc.
150 POCONO ROAD
BROOKFIELD, CONNECTICUT 06804
TEL: (203) 775-9659 TWX: 710-456-0052

Skyles Electric Works

PAL-80™



- 80 characters per line
- 8½ inch wide thermal paper
- Full graphics at 60 dots/inch
- Interfaced to PET
- Works with all PET peripherals
- 40 character per second rate
- Microprocessor controlled
- Bidirectional look-ahead printing
- Quiet operation
- No external power supplies
- Only two driven parts
- High reliability
- Clear 5 x 7 characters
- Attractive metal and plastic case

The Skyles PAL-80™ is a high speed thermal printer offering the combination of text printing at 80 characters per line and continuous graphics at 60 dots per inch. In the text mode, upper and lower case data are printed at 40 characters per second. The 5 x 7 characters provide clear readable copy on white paper; no hard to find, hard to read aluminized paper.

In the graphics mode, seven bits of each byte correspond to the seven dots in each of the 480 print positions per line. Since the computer driving the printer has full control over every print position, it can print graphs, bar charts, line drawings, even special and foreign language symbols. Despite its low cost, the Skyles PAL-80 is a true intelligent printer with full line buffering and bidirectional look-ahead printing.

High reliability is designed in: The thick film thermal print head has a life expectancy of 100,000,000 characters. Two DC stepping motors provide positive control of the print head and the paper drive.

The Skyles PAL-80 operates directly from a 115V 60 Hz line (230V 50 Hz available). No external power supplies are required.

It comes complete with an interface for the PET: a two and a half foot cable plugs into the IEEE interface at the back of your PET. Works with all PET models and PET or Skyles peripherals.

Please send me ________ **Skyles PAL-80 printer(s)** complete with 2½ foot interface cable to attach to my PET at **$675.00 each*** (Plus $10.00 shipping and handling). I also will receive a test and graphics demonstration tape at no additional charge and over 150 feet of 8½ inch wide black on white thermal paper $________

I would also like to order ________ rolls of 8½ inch wide by 85 ft. long thermal paper (black ink) at $5.00 each $ ________

________ 10 roll cartons at $45.00 $________

VISA, Mastercharge orders call **(800) 227-8398**
California orders call **(415) 494-1210**

*California residents add 6 to 6½% sales tax where applicable.

PAL-80 SPECIFICATIONS

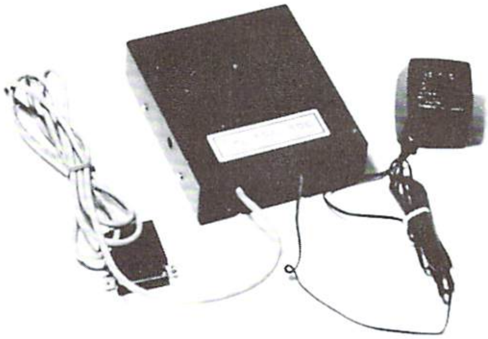
TEXT	
Format	80 characters per eight inch line 6 lines per inch nominal
Print speed	40 characters per second
Line Feed	50 milliseconds nominal
Character Set	96 Characters, including upper and lower case, numerals, and symbols
GRAPHICS	
Format	480 print positions per line
Print Speed	240 print positions per second
COMMON	
Paper	8½ inch wide thermal paper, available in 85 foot folls, black image on white
Dimensions	12"W x 10"D x 2¾"H
Weight	8 lbs (3.6 kg)

Skyles Electric Works

10301 Stonydale Drive
Cupertino, CA 95014 • (408) 735-7891

TM PAL-80 Printer on A Leash, a trademark of Skyles Electric Works Inc.

PET Printer Adapter



The CmC ADA 1200 drives an RS-232 printer from the PET IEEE-488 bus. Now, the PET owner can obtain hard copy listings and can type letters, manuscripts, mailing labels, tables of data, pictures, invoices, graphs, checks, needlepoint patterns, etc., using RS-232 standard printer or terminal.

A cassette tape is included with software for plots, formatting tables and screen dumps. The ADA1200 sells for $169.00 and includes case, power supply and cable.

Order direct or contact your local computer store.

VISA AND M/C ACCEPTED — SEND ACCOUNT NUMBER, EXPIRATION DATE AND SIGN ORDER.
ADD $3 PER ORDER FOR SHIPPING & HANDLING — FOREIGN ORDERS ADD 10% FOR AIR POSTAGE

CONNECTICUT microCOMPUTER, Inc.
150 POCONO ROAD
BROOKFIELD, CONNECTICUT 06804
TEL: (203) 775-9659 TWX: 710-456-0052

CONTROL 'f.' The editor will place the cursor immediately after the first occurance of the search string. CONTROL 'f' will take you to the next occurance, etc. till the end of text.

COPY. Similar to the SEARCH function, the Editor can COPY the word or phrase that is on the first line anywhere you place the cursor and type CONTROL '*.' This saves the time of typing the same phrase or company name over many times.

ERASE. One can erase all the text by typing CONTROL 'e' followed by 'a' (for all). Typing CONTROL 'e' followed by 'r' erases all text after the cursor position.

MERGE. Text from a file on disk can easily be merged into the file you are presently working on. Simply place your cursor on the line where you wish to merge the new text. Then LOAD the new text.

MOVE. Whole sections of text can be moved from one place to another. This is helpful if you wish to rearrange your paragraph order.

HYPHENATION. Semi-automatic hyphenation is available. You just place a special hyphen symbol (shifted '@,' graphically displayed as a '-') where you would like the word hyphenated if need be. When printed the word will be hyphenated at that point if necessary, otherwise the hyphen will be ignored.

FORMATTING FUNCTIONS. When your text is formatted onto the printed page you have many print features to control. Line spacing is variable, single, double, or other. Margin release and indentation is handy to use. You can set both Right and Left margins. The nicest feature is the justification feature. You can have your printed copy justified both left and right.

APPEND. Since there are two distinct and separate text areas, you may compose lines or paragraphs in the alternate text area and number them. Later while writing your text you can call any of your previously defined lines by number. Thus you can have a disk of numbered paragraphs which you load into the alternate text area. These then can be called into your main text as you need them, in any order.

VARIABLE DATA BLOCKS. Here is a feature I was pleased with. You can have variables in your text. This is ideal for form letters. First compose the letter, leaving blank the name & address, and other variable info, such as amount of money owed, etc. Then in your alternate text area enter the name, address & other info needed, in the correct order as used in your main text. You can enter this info for more than just the first one. When done with the data for the first, simply begin the sequence again for the second, then the third, etc.

The variable data in your main text can be filled manually, semi-automatically, or automatically. Also, there is a special printing option which will print your main text and fill in the variable data as it goes. It will type one right after the other (hopefully you put in some page commands at the end of the letter).

PET Word Processor

**8K
and
16/32K
PET
versions**

CmC
SOFTWARE
Word
Processor
Program
CmC
SOFTWARE
Word
Processor
Program

This program permits composing and printing letters, flyers, advertisements, manuscripts, etc., using the COMMODORE PET and a printer.

Printing directives include line length, line spacing, left margin, centering and skip. Edit commands allow you to insert lines, delete lines, move lines and paragraphs, change strings, save files onto and load files from cassette (can be modified for disk), move up, move down, print and type.

Added features for the 16/32K version include string search for editing, keyboard entry during printing for letter salutations, justification, multiple printing and more.

A thirty page instruction manual is included.

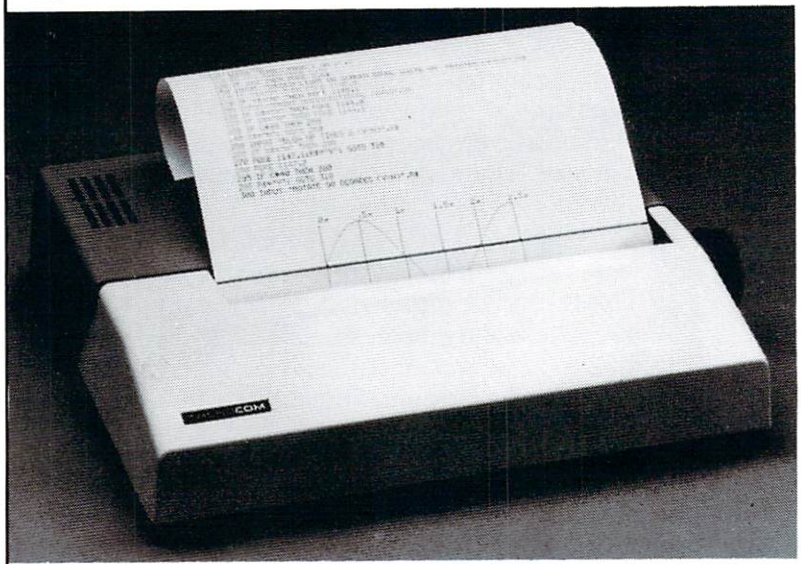
The CmC Word Processor Program for the 8K PET is $29.50. The 16/32K version is $39.50.

Order direct or contact your local computer store.

VISA AND M/C ACCEPTED — SEND ACCOUNT NUMBER, EXPIRATION DATE AND SIGN ORDER.
ADD $1 PER ORDER FOR SHIPPING & HANDLING — FOREIGN ORDERS ADD 10% FOR AIR POSTAGE

CONNECTICUT microCOMPUTER, Inc.
150 POCONO ROAD
BROOKFIELD, CONNECTICUT 06804
TEL: (203) 775-9659 TWX: 710-456-0052

Skyles Electric Works **PAL-80™**



- 80 characters per line
- 8½ inch wide thermal paper
- Full graphics at 60 dots/inch
- Interfaced to PET
- Works with all PET peripherals
- 40 character per second rate
- Microprocessor controlled
- Bidirectional look-ahead printing
- Quiet operation
- No external power supplies
- Only two driven parts
- High reliability
- Clear 5 x 7 characters
- Attractive metal and plastic case

The Skyles PAL-80™ is a high speed thermal printer offering the combination of text printing at 80 characters per line and continuous graphics at 60 dots per inch. In the text mode, upper and lower case data are printed at 40 characters per second. The 5 x 7 characters provide clear readable copy on white paper; no hard to find, hard to read aluminized paper.

In the graphics mode, seven bits of each byte correspond to the seven dots in each of the 480 print positions per line. Since the computer driving the printer has full control over every print position, it can print graphs, bar charts, line drawings, even special and foreign language symbols. Despite its low cost, the Skyles PAL-80 is a true intelligent printer with full line buffering and bi-directional look-ahead printing.

High reliability is designed in: The thick film thermal print head has a life expectancy of 100,000,000 characters. Two DC stepping motors provide positive control of the print head and the paper drive.

The Skyles PAL-80 operates directly from a 115V 60 Hz line (230V 50 Hz available). No external power supplies are required.

It comes complete with an interface for the PET: a two and a half foot cable plugs into the IEEE interface at the back of your PET. Works with all PET models and PET or Skyles peripherals.

Please send me________ **Skyles PAL-80 printer(s)** complete with 2½ foot interface cable to attach to my PET at **$675.00 each*** (Plus $10.00 shipping and handling). I also will receive a test and graphics demonstration tape at no additional charge and over 150 feet of 8½ inch wide black on white thermal paper $________

I would also like to order _______ rolls of 8½ inch wide by 85 ft. long thermal paper (black ink) at $5.00 each $____________

________ 10 roll cartons at $45.00 $____________

VISA, Mastercharge orders call **(800) 227-8398**
California orders call **(415) 494-1210**

*California residents add 6 to 6½% sales tax where applicable.

PAL-80 SPECIFICATIONS

TEXT	
Format	80 characters per eight inch line 6 lines per inch nominal
Print speed	40 characters per second
Line Feed	50 milliseconds nominal
Character Set	96 Characters, including upper and lower case, numerals, and symbols
GRAPHICS	
Format	480 print positions per line
Print Speed	240 print positions per second
COMMON	
Paper	8½ inch wide thermal paper, available in 85 foot folls, black image on white
Dimensions	12"W x 10"D x 2¾"H
Weight	8 lbs (3.6 kg)

Skyles Electric Works

10301 Stonydale Drive
Cupertino, CA 95014 • (408) 735-7891

TM PAL-80 Printer on A Leash, a trademark of Skyles Electric Works Inc.

TYPING OPTIONS. You can do more than just type one copy of your main text. You can type up to 255 copies of the text. And as mentioned above you can have variable blocks filled as the printer types.

DISK COMMANDS. Most commonly used disk commands are available while using the Commodore Editor. They are simplified too. To initialize a diskette in drive 1 simply type CONTROL '*' to get into disk control mode. Then type 'i1'. That is all there is to it.

END NOTES. I am sure you will be hearing a lot about this Word Processor from Commodore. And remember, I have described the first version. Another version is in the works that makes this one look primitive. I will be telling you about that one as soon as I see it. If you are looking for a good word processor and you have a NEW PET and DISK and PRINTER then I highly recommend this particular one.

WORD PROCESSOR PROGRAM (WPP) $29.50

CONNECTICUT MICROCOMPUTER
150 Pocono Rd.
Brookfield, CT 06804

This is one of the first word processors available for the PET. It now is also available in an expanded version for the NEW PET. I have just received a review copy of that new version and will be able to report on it next issue. The version for the OLD PET is very good. I used it to do my last few newsletters and enjoyed using it very much. All that is needed to use this word processor is an 8K PET. It can display its final output on either the PET screen or a printer. I have received tapes by mail that were data tapes to be used with this program. These tapes are used as input and then printed out on my printer. I could set up my own line length etc. This is very nice.

This is a line oriented word processor. As you enter the text it is automatically assigned a line number. Each time you hit return you go on to the next line number. Lines can be moved, replaced, inserted, changed, and deleted. Printer commands are put right in with the text. They are refered to as directives. There are two main modes of operation. In Command Mode you can look at lines, change things, save the text on tape, etc. The other major mode is INPUT MODE. While in this mode you are entering the text, line by line.

Even though your text is entered and assigned sequential line numbers the lines are not printed that way. When printed, all the lines are treated as one long string of data (and directives for the printer). Sentences are printed one after another. A new paragraph is started only when a) a directive is encountered, or b) a line begins with a space. This word processor is very versatile and flexible, but does require getting used to the commands and directives. I use a small index card with the commands summarized on one side and the directives on the other. Commands and directives are represented in a very logical and easy to remember manner. I had very little trouble getting used to them.

You will have to get used to thinking of your text as a series of lines sequentially numbered. You are always positioned at the 'current line number.' This doesn't have to be the last line you typed in. You can move to any line you wish while in the Command Mode. Many of the commands use the 'current line number' as a reference point. For example you may wish to go up 5 lines. The program takes the line you are now at and puts you at the line 5 above it. The program will always print on the screen the text in the line you currently are on.

FREE BYTES. For example, to find out how many free bytes are left you enter the command 'FREE' or simply enter 'F.' The program then would respond and tell you how many bytes were free.

DOWN. Moves the current line pointer down as many lines as you specify. It will not go past the last line number currently assigned. For example, if you are at line 75 and go down 10, but line 80 is the last line, you will be placed at line 80.

UP. This command will move the current line pointer up the number of lines you request. It goes up as far as line number 0. If you are on line 5 and ask to go up 9 you will end up on line 0.

GO TO. You can go to any line you wish with this command. If you wish to make a correction to line 51, simply go to that line.

REPLACE. The Replace command allows you to replace any line with the next one you type in.

CHANGE. This command is very handy for correcting spelling errors or changing words. First go to the line you wish to change. Then specify what string you wish to change, and what you wish to change it to. For example, you might change 'their' to 'there.'

MOVE. You can move any number of consecutive line numbers to another location very easily. All line numbers are reassigned to once again be in correct ascending order.

INSERT. To insert a line or several lines in between 2 existing lines, simply go to the first of the two lines (the one you wish to insert after) and go into INPUT mode. All line numbers already in your text after that line number will be increased by one for every line you insert.

ERASE. Lines may be erased a whole line at a time, or even a whole group of consecutive lines at once using this command.

TYPE. This is different than PRINT. Print is your formatted text. Type will type out the lines as they are stored presently. They can be typed onto your screen or to your printer.

PRINT. This command prints your text either to your screen or to your printer in its finished form. All directives within the text are followed.

Business Programs for the PET

Dr. Daley continues to expand software for the PET. Some of our newest offerings for the businessman are listed below.

These programs are available NOW for the COMPU/THINK disk and will be converted to the COMMODORE disk as soon as one can be obtained. All come with documentation.

We have in progress programs for Billing, Ledger and Modified Inventory. Call for prices and delivery.

Inventory

This program will maintain a complete inventory for the small business. Functions include entering and editing of the new inventory, modifying individual records, and a variety of reports. $99.95

Estimate

This set of four programs will build a file for use, in conjunction with one version of the above inventory files, to prepare accurate estimates for an individual job. This program can eliminate the difficulties and inaccuracies of quote preparation. $99.95

Mail List

This program will maintain a mailing list of about 6000 names kept in zip code sequence. Individual records are accessed in seconds, and the entire list or any subset may be printed on labels.. . . . . . $99.95

Your order will be shipped within four business days from receipt.

Charge your order to
MC/VISA

master charge
THE INTERBANK CARD

VISA

DR. DALEY, 425 Grove Avenue, Berrien Springs, Michigan 49103
Phone (616) 471-5514 Sun. thru Thurs., noon to 9 p.m. eastern time.

SAVE. Your text is saved as data onto cassette tape on cassette unit #1 with this command. I have found the data saved to be very reliable. It would LOAD later without problems.

LOAD. This allows you to load in text previously saved by this program. You can start with an empty text and load in one to work with. Or you can add to the current text in memory. To add to your current text simply set your 'current line pointer' at the line you wish this text on tape to be added after. Then LOAD in the tape.

INPUT. Of course there is the Input command. It puts you into "Input Mode". I will describe this mode and its "Directives" next.

DIRECTIVES. All directives must start in the first column of a line or they will be treated as text. You use the directives to instruct the printer how you would like your output printed. All directives begin with a '.'. For example, .ce is the directive for center the next string (as for a heading).

CENTER. You can have headings centered very easily with this directive. Be careful not to try to center a 40 character string within a 30 character line length.

LINE LENGTH. You can change the line length at any time during the printing of the text. The default line length is 60. The line length begins at the Left Margin and creates a Right Margin that many spaces to the right.

LEFT MARGIN. The left margin is set at 1 by default, but you can assign any left margin you wish, and it can be changed at any time within your text. For example, you currently have a Left Margin of 10 and Line Length of 60. That means your Right Margin is at 70. Now you can change your Left margin to 30. Your Right Margin now would be 90 since you did not change your Line Length.

LINE SPACING. Your text is printed single spaced unless you specify otherwise. You can print double or triple spaced text. Once again, this can be changed at any point within your text.

SKIP A LINE. You can add blank lines with this directive. It will skip as many lines as you specify.

NO LINE FEED. You can overprint using this directive. This line will be printed without a line feed on the printer. Underlining is available without having to use this feature.

REPEAT CENTERED. Any string can be repeated as many times as you wish and then centered on the page. For example, 'XO' repeated 5 times would be 'XOXOXOXOXO.' It would be centered on the line. This is handy for creating dividing lines on your page.

NEW LINE. You need to be able to tell the printer when to start a new paragraph. A new paragraph is started any time a directive is encountered. You may also have the printer start a new line by leaving at least one space at the start of that line. Your paragraph will be indented by the number of spaces you begin the line with.

PAUSE. This directive is handy if you wish to do personalized form letters. The program waits until you hit a key on the PET before continuing. This allows you to use the keyboard on your printer (if you have one) to type in the person's name, etc., before continuing with the text.

SEND ASCII CODE. You can direct the PET to output any ASCII character code you wish. I have used this to have it ring the bell on my Teletype 43.

THE TEXT. Any of these directives can be interspersed with your text. To enter your text, simply type it in. The delete key works as usual to erase typing errors. You can hit RETURN after any word, though it is optional. I find it best to hit return after every sentence, although it is not necessary. This way, I can move lines around later and don't have to worry about partial lines, etc.

WORD PROCESSOR $19.95

programmed by Mike Richter
marketed by
PROGRAMMA INTERNATIONAL
3400 Wilshire Blvd.
Los Angeles, CA 90010

This is a very good word processor. It does what you need in ordinary use, and doesn't subject you to learning special commands to use it. It works with either OLD or NEW PETs and even has a special version for use with the AXIOM printer. Another version is for use with any RS232 printer via an RS232 interface. Text is stored on cassette. A minimal system for its use would be an 8K PET with 1 cassette unit. Since it can print your finished text either on the screen or printer, the printer is optional. Of course you will probably want your text printed on hard copy, but it is possible to put together your text, save it on tape, and later print it onto paper at your friend's house, local dealer, or just send it via mail as a letter on tape.

This word processor has several modes and for your convenience displays a menu of your choices. You choose from:

- Edit the text
- Input from tape
- Output to tape
- Print the output
- Read to screen
- Write something new

Simply decide what you wish to do and hit the key matching the first letter of that choice (E for Edit the text).

WRITE SOMETHING NEW. All text presently in memory is erased when you enter this mode (To modify your present text you would enter EDIT mode). Your keyboard now acts like a smart typewriter (shift for upper case). You do not have to hit return after each line or sentence. As a matter of fact, the return key is ignored. Simply type your text as a continuous string.

Use the up arrow key to separate paragraphs. Paragraphs are automatically indented as you specify when in PRINT mode. To get an extra blank line in between paragraphs simply type two up arrows consecutively. The delete key works as usual allowing you to erase your typing errors as you go. Hit the backslash key to signify the end of input. You will then be presented with the menu of choices again.

EDIT THE TEXT. Editing the text is performed in a manner requiring little effort on your part. There are no fancy commands to learn. Text is displayed on the screen in blocks of about 4 lines. The cursor is moved with the cursor keys. Place the cursor over a character. Now hit delete and it is deleted, and the rest of text in the block is moved over 1 to the left to fill the "hole." To insert something simply hit the up arrow key. The character where the cursor was is lit up to remind you where you are inserting into. A new cursor is now below the block of text. You simply type in what you wish to insert and end with the backslash key. The character lit up is then replaced with the string you just typed for the insert.

PRINT THE OUTPUT. Printing your text is very easy. All you need to do is answer these simple questions:

1) HOW MANY SPACES IN A TAB?
You may type in any digit from 0 to 9. Each paragraph will be indented this many spaces. You do not have to hit return after your choice. New paragraphs are identified in your text by the up arrow.

2) TO SCREEN OR PRINTER?
Hit S and the text will be printed onto your screen. Hit P and it will print onto your printer (device #5 — if yours is a different device you must change the basic program in two lines).

3) DOUBLE SPACE?
Hit Y and your output will be double spaced. Hit N and your output will be single spaced.

4) HOW MANY CHARACTERS PER LINE?
Now you will be setting your margins. It will set right and left margins so as to fit the number of characters in each line on the page with even margins on both sides (centered on the page).

If you chose to print to the screen it will also ask you:

5) HOW MANY LINES PER PAGE?
While printing on the screen you must remember you will only be able to view 25 lines at a time. This question allows you to set how many lines to print on the screen before pausing to allow you to read them. After printing the number of lines you specify, it will print a blank line and then print the message "KEY SPACE TO CONTINUE" in reverse field. This is followed by a blank line. Thus the maximum number of lines viewable on one screen is 22 (39 characters per line).

Once you have answered these questions it prints your text. That is all there is to it. When it is done, it once again displays the menu of choices on the screen for you.

READ TO SCREEN. This is an easy way to see your text without having to answer the questions asked in the PRINT mode. It will print 20 lines per screen, 39 characters per line, single spaced, with a tab of 5. This is probably what you would choose anyway. If you wish something else simply use the PRINT mode. When all text has been displayed, you once again are returned to the menu.

OUTPUT TO TAPE. One of the major benefits of a word processor is the ability to save your text on tape (or disk) for use later without having to key it all in again. Choose this option and save your text on tape using cassette unit #1. When through saving the text you are returned to the menu again. This word processor gives you an option I have not often seen elsewhere. When in OUTPUT TO TAPE mode it first asks you what the file's name is. Thus you can label your text files on tape. But then it asks you:

DO YOU WANT TO SAVE THE PROGRAM?

If you hit N it simply saves your text on tape. But if you hit Y it will first save the Word Processor program and immediately after it save your text. Thus each of your text files can be on tape with the program that will use them. This is a very handy option.

INPUT FROM TAPE. Hit I to choose this option from the menu. It will then prompt you to PRESS PLAY ON TAPE #1. Simply put your text data tape in tape #1 and press PLAY and it will be loaded in. This program is nice enough to tell you what text file you are loading in by printing the file's name on the screen after it reads the header.

So here is a very easy to use word processor that does a lot. Recommended for its simplicity and usefulness.

Dealers Wanted

Sell Commodore Business Computers

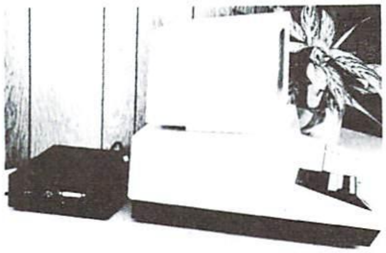
Make New Profits
From an Initial Low
Investment of Less Than
$3,000.

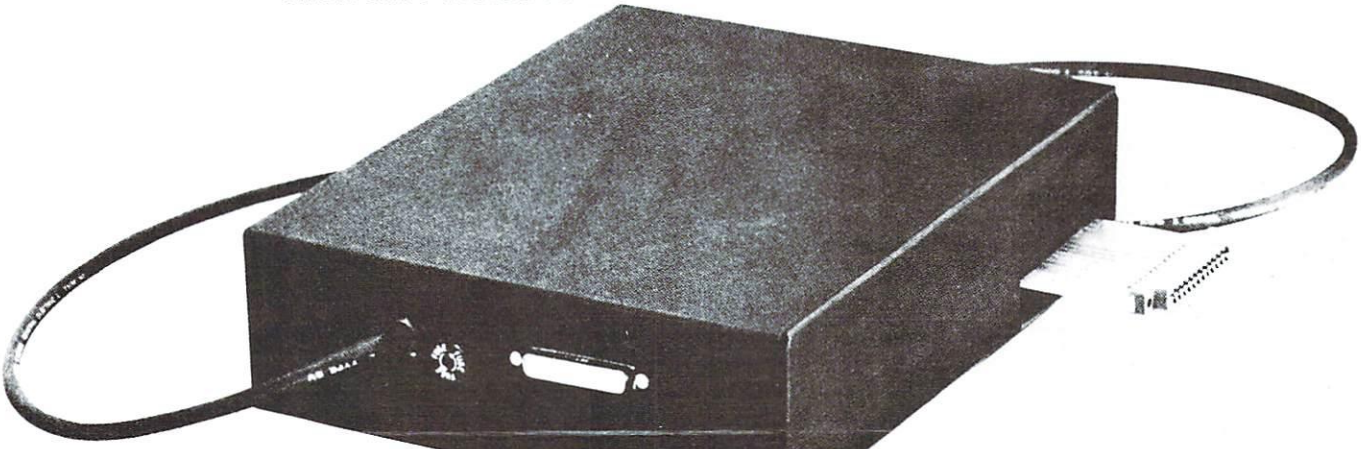
Contact the Southeastern Distributor

Jerry G. Zeigler
Zeigler Electronic Products
3661 Calumet Rd.
Decatur, GA 30034
(404) 289-2265/289-1596

PET RS-232C Serial Adapter

- Uses the PET IEEE Bus
- RS-232C Serial Input/Output
- 20 MA Current Loop (active or passive)
- Crystal Controlled Baud Rates (75 to 9600 Baud)
- Full Duplex
- Selectable IEEE device address
- IEEE Bus extended for other devices
- Power supply and enclosure included





PET RS-232C Serial Adapter

DIMENSIONS:	2.5" x 8" x 10"
POWER REQUIREMENTS:	117 VAC at 25 watts
SERIAL INPUT/OUTPUT SPECIFICATIONS:	EIA RS-232C female connector User selectable serial channels EIA RS-232C 20 MA current loop active 20 MA current loop passive User selectable baud rates: 75 300 3600 110 600 4800 134.5 1200 7200 150 1800 9600 200 2400
IEEE-488 INPUT/OUTPUT SPECIFICATIONS:	Complies with IEEE-488 Std 1975 Selectable talker/listener address (device 4-7) Address factory strapped for device 4 PET IEEE Bus is extended for other devices

Now you can have RS-232C capability with your PET. With the RS-232C Serial Adapter you can use your PET as a terminal, or get hard copy from any serial printer, including current loop devices.

The Serial Adapter is designed to be fully compatible with the IEEE-488 Bus and allows you to use other 488 devices with the PET at the same time.

$225.00

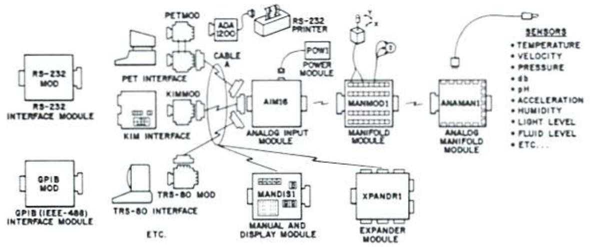
Please add $5.00 shipping and handling.

COMPUTER
ASSOCIATES
LTD.

1107 Airport Road, Ames, Iowa 50010
515-233-4470

PET is a trademark of Commodore Business Machines, Inc.

Data Acquisition Modules

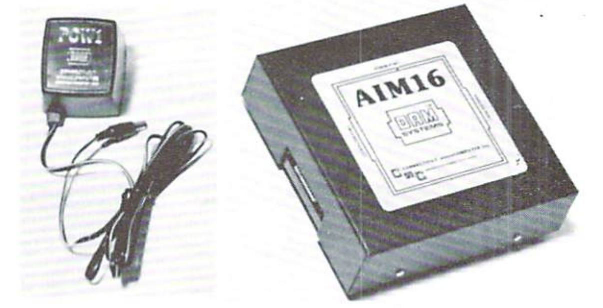

PETMOD
ADA 1200
RS-232 PRINTER
SENSORS
• TEMPERATURE
• VELOCITY
• PRESSURE
• db
• pH
• ACCELERATION
• HUMIDITY
• LIGHT LEVEL
• FLUID LEVEL
• ETC...
RS-232 MOD
RS-232 INTERFACE MODULE
PET INTERFACE
CABLE A
POW1
POWER MODULE
KIMMOD
KIM INTERFACE
AIM16
ANALOG INPUT MODULE
MANMOD1
MANIFOLD MODULE
ANAMAN1
ANALOG MANIFOLD MODULE
GPIB MOD
GPIB (IEEE-488) INTERFACE MODULE
TRS-80 MOD
TRS-80 INTERFACE
ETC.
MANDIS1
MANUAL AND DISPLAY MODULE
XPANDR1
EXPANDER MODULE

The world we live in is full of variables we want to measure. These include weight, temperature, pressure, humidity, speed and fluid level. These variables are continuous and their values may be represented by a voltage. This voltage is the analog of the physical variable. A device which converts a physical, mechanical or chemical quantity to a voltage is called a sensor.

Computers do not understand voltages: They understand bits. Bits are digital signals. A device which converts voltages to bits is an analog-to-digital converter. Our AIM16 (Analog Input Module) is a 16 input analog-to-digital converter.

The goal of Connecticut microComputer in designing the DAM SYSTEMS is to produce easy to use, low cost data acquisition modules for small computers. As the line grows we will add control modules to the system. These acquisition and control modules will include digital input sensing (e.g. switches), analog input sensing (e.g. temperature, humidity), digital output control (e.g. lamps, motors, alarms), and analog output control (e.g. X-Y plotters, or oscilloscopes).

Analog Input Module


POW1
AIM16
DAM SYSTEMS

The AIM16 is a 16 channel analog to digital converter designed to work with most microcomputers. The AIM16 is connected to the host computer through the computer's 8 bit input port and 8 bit output port, or through one of the DAM SYSTEMS special interfaces.

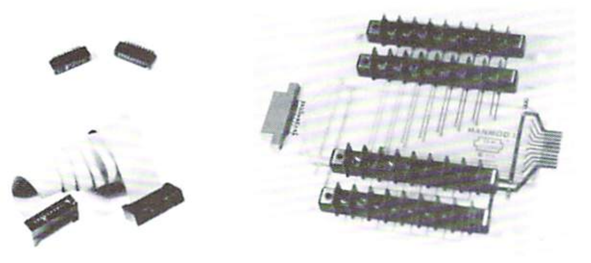
The input voltage range is 0 to 5.12 volts. The input voltage is converted to a count between 0 and 255 (00 and FF hex). Resolution is 20 millivolts per count. Accuracy is 0.5% ± 1 bit. Conversion time is less than 100 microseconds per channel. All 16 channels can be scanned in less than 1.5 milliseconds.

Power requirements are 12 volts DC at 60 ma.

The POW1 is the power module for the AIM16. One POW1 supplies enough power for one AIM16, one MANMOD1, sixteen sensors, one XPANDR1 and one computer interface. The POW1 comes in an American version (POW1a) for 110 VAC and in a European version (POW1e) for 230 VAC.

AIM16 . . . $179.00
POW1a . . . $ 14.95
POW1e . . . $ 24.95

Connectors



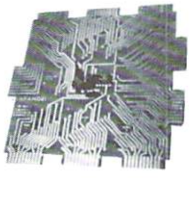
The AIM16 requires connections to its input port (analog inputs) and its output port (computer interface). The ICON (Input CONnector) is a 20 pin, solder eyelet, edge connector for connecting inputs to each of the AIM16's 16 channels. The OCON (Output CONnector) is a 20 pin, solder eyelet edge connector for connecting the computer's input and output ports to the AIM16.

The MANMOD1 (MANifold MODule) replaces the ICON. It has screw terminals and barrier strips for all 16 inputs for connecting pots, joysticks, voltage sources, etc.

CABLE A24 (24 inch interconnect cable has an interface connector on one end and an OCON equivalent on the other. This cable provides connections between the DAM SYSTEMS computer interfaces and the AIM16 or XPANDR1 and between the XPANDR1 and up to eight AIM16s.

ICON . . . $ 9.95
OCON . . . $ 9.95
MANMOD1 . . . $59.95
CABLE A24 . . . $19.95

XPANDR1



The XPANDR1 allows up to eight AIM16 modules to be connected to a computer at one time. The XPANDR1 is connected to the computer in place of the AIM16. Up to eight AIM16 modules are then connected to each of the eight ports provided using a CABLE A24 for each module. Power for the XPANDR1 is derived from the AIM16 connected to the first port.

XPANDR1 . . . $59.95

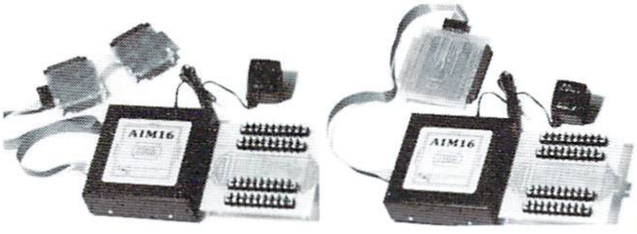
TEMPSENS

This module provides two temperature probes for use by the AIM16. This module should be used with the MANMOD1 for ease of hookup. The MANMOD1 will support up to 16 probes (eight TEMPSENS modules).

Resolution for each probe is 1°F.

TEMPSENS2P1 (-10°F to 120°F) . . . $49.95

Computer Interfaces and Sets



For your convenience the AIM16 comes as part of a number of sets. The minimum configuration for a usable system is the AIM16 Starter Set 1. This set includes one AIM16, one POW1, one ICON and one OCON. The AIM16 Starter Set 2 includes a MANMOD1 in place of the ICON. Both of these sets require that you have a hardware knowledge of your computer and of computer interfacing.

For simple plug compatible systems we also offer computer interfaces and sets for several home computers.

The PETMOD plugs into the back of the Commodore PET computer and provides two PET IEEE ports, one user port and one DAM SYSTEMS port. The PETMOD is connected to the AIM16 or XPANDR1 with CABLE A24. The PETSET1 includes one PETMOD, one CABLE A24, one AIM16, one POW1 and one MANMOD1. To read and display a single AIM16 channel (N) using the PETSET1 the BASIC statements

```
POKE59426,N:POKE59426,255:X=PEEK(59471):PRINT"CHANNEL "N"="X
```

are all that is needed.

The KIMMOD plugs into the COMMODORE KIM applications connector and provides one application connector and one DAM SYSTEM'S port. The KIMMOD is connected to the AIM16 or XPANDR1 with CABLE A24. Assembly and machine language programs for reading and displaying data are included. The KIMSET1 includes one KIMMOD, one CABLE A24, one AIM16, one POW1 and one MANMOD 1.

All sets come in American and European versions.

AIM16 Starter Set 1a (110 VAC) . . .	**$189.00**
AIM16 Starter Set 1e (230 VAC) . . .	**$199.00**
AIM16 Starter Set 2a (110 VAC) . . .	**$259.00**
AIM16 Starter Set 2e (230 VAC) . . .	**$269.00**
PETMOD . . .	**$ 49.95**
KIMMOD . . .	**$ 39.95**
PETSET 1a . . .	**$295.00**
PETSET1e . . .	**$305.00**
KIMSET1a . . .	**$285.00**
KIMSET1e . . .	**$295.00**

Coming Soon

TEMPSENS-2P with other temperature ranges. Interfaces for TRS-80, APPLE, AIM65. Light sensors. Output modules. Contact us for price and availability.

Dealers

Give your potential customers a reason for buying your computers. We offer excellent discounts to legitimate dealers. Contact us for our dealer pack.

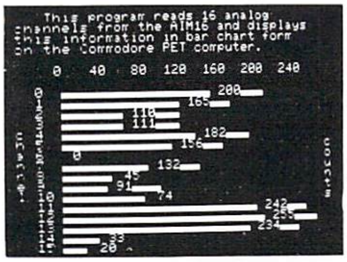
Our Guarantee of Satisfaction

Our customers are our most important asset. We want you to be pleased with whatever you purchase from us. We strive to offer top quality products at reasonable prices. We believe you should see an item before you spend your hard earned cash for it.

Ask for a demonstration at your local computer store so you can be sure our products perform as you want them to perform. Your dealer is a valued source of information and advice.

If you cannot see our products in advance, and order direct from us, we offer a money back guarantee. If our products don't perform as you expect, return the merchandise to us within 30 days, in its original condition, and we will refund the purchase price.

Our standard warranty for all our products is 90 days.



This program reads 16 analog channels from the AIM16 and displays this information in bar chart form on the Commodore PET computer.

Order Form

CONNECTICUT microCOMPUTER, Inc.
150 POCONO ROAD
BROOKFIELD, CONNECTICUT 06804
TEL: (203) 775-9659 TWX: 710-456-0052

QUANTITY	DESCRIPTION	PRICE	TOTAL
SUBTOTAL			
Handling and shipping — add per order			$3.00
Foreign orders add 10% for AIR postage			
Connecticut residents add 7% sales tax			
TOTAL ENCLOSED			

NAME ______

COMPANY ______

ADDRESS ______

CITY ______

STATE ______ ZIP ______

VISA ○ M/C ○ Expiration date ______

Card number ______

MICROCOMPUTERS FOR NUCLEAR INSTRUMENTATION*

Excerpted from a paper presented at the Conference and Exhibits on Small Computers. Session on Applications in Engineering and Science Clemson University. Clemson, South Carolina. May 23-24, 1979.

J.S. Byrd
Staff Engineer

Savannah River Laboratory
E.I. duPont de Nemours and Co.
Aiken, South Carolina 29801

SUMMARY

Small, desk-top Commodore PET® computers are being used to solve nuclear instrumentation problems at the Savannah River Laboratory (SRL). The ease of operating, programming, interfacing, and maintaining the PET computer makes it a cost-effective solution to many real-time instrumentation problems that involve both data acquisition and data processing. The IEEE-488 GPIB (General Purpose Instrument Bus) is an integral part of the PET hardware.

This paper reviews GPIB design concepts and discusses SRL applications that use the PET computer as a GPIB controller.

Since the development and the commercial introduction of the Intel* 8008 8-bit microprocessor in 1972, SRL has used programmed microprocessor-based digital systems to solve laboratory instrumentation problems. The initial cost of $200 per unit for the Intel 8008 module made it an attractive design component for sophisticated digital systems. Several systems[1] [3] were designed with this module. Those systems are still used daily and have operated reliably and required very little maintenance.

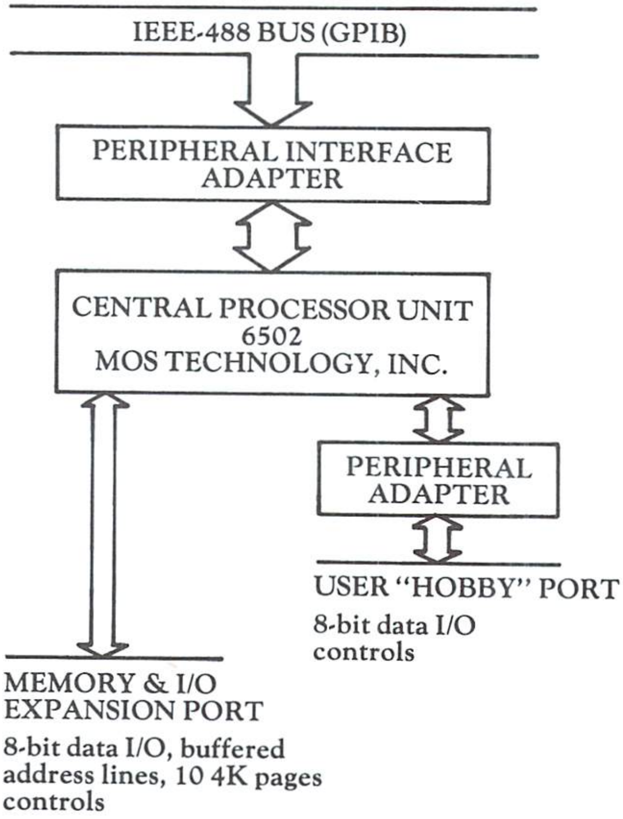
During the next few years, more sophisticated microprocessors (Intel* 8080, Motorola** 6800, etc.) and supporting large-scale integration (LSI) interface modules and memory modules were available to design engineers. Industry competition and improved manufacturing techniques rapidly reduced the cost of LSI devices. By 1974 many "home" and "hobby" computer systems became commercially available. These ranged in price from several hundred to several thousand dollars depending on capability. These computer systems generally lacked manufacturer software support and peripheral device support. The "home computer" description was somewhat misleading since users needed expertise in both hardware and software. We evaluated several of these systems for laboratory applications, but we concluded that special purpose in-house designs met our instrumentation needs better.[4] [5]

In 1977 self-contained, desk-top microcomputers appeared in the electronics industry market. Commodore Business Machines, Inc., began delivering its PET-2001 computer, which was the first "affordable" integral single package unit for the home computer novice. The single package unit costs $795. The specifications, such as an advanced BASIC* interpreter, were also attractive. Integral input/output hardware and software to support the IEEE-488 GPIB make the PET computer a versatile controller and data processor for laboratory experiments.

THE PET COMPUTER

The PET computer is designed around the MOS Technology** 6502 8-bit microprocessor.[6] It has a cathode ray tube (CRT) display, compressed keyboard, and cassette tape transport; all three peripherals are integrated into a single desk-top package. (Figure 1). Its firmware package (built-in programs) occupies 14K memory addresses which consist of a BASIC interpreter, operating system, and peripheral utility programs. The standard RAM (random access memory) occupies 8K addresses; expansions up to 32K are supported by the firmware.[7]

FIGURE 1. PET Input/Output Ports


IEEE-488 BUS (GPIB)
PERIPHERAL INTERFACE ADAPTER
CENTRAL PROCESSOR UNIT 6502 MOS TECHNOLOGY, INC.
PERIPHERAL ADAPTER
USER "HOBBY" PORT
8-bit data I/O controls
MEMORY & I/O EXPANSION PORT
8-bit data I/O, buffered address lines, 10 4K pages controls

---

* The information contained in this article was developed during the course of work under Contract No. AT(07-2)-1 with the U.S. Department of Energy.

* Intel Corp., 3065 Bowers Ave., Santa Clara, CA 95051.
** Motorola, Inc., Box 20912, Phoenix, AZ 85036.

* BASIC (Beginners All-purpose Symbolic Instruction Code).
** MOS Technology, Inc. is owned by Commodore Business Machines, Inc., Palo Alto, CA.

The PET has three ports to connect I/O peripheral devices (Figure 1). A portion of a peripheral interface LSI module (MOS Technology 6522) is dedicated to a user "hobby" port that allows an 8-bit exchange of data with I/O devices. Also, that port can supply a programmed frequency square wave signal to external peripherals. An expansion port for memory and I/O devices has buffered central processing unit (CPU) signals (data and handshake controls) and decoded 4K page addressing signals. Both the expansion and "hobby" port can be controlled by "peeking" and "poking" from a BASIC program or by a custom machine language program[8] that resides in memory. A short machine program might be loaded from cassette via a BASIC program (for example, as a DATA STATEMENT) or more complex machine programs may be installed as permanent additions to firmware.

The IEEE-488 GPIB port is supported by the BASIC and operating system firmware as the primary peripheral I/O port. It is controlled from BASIC with file structured "print," "get," and "input" commands. Commodore peripherals (printer, disk, etc.) are "intelligent" GPIB devices.

THE IEEE-488 GPIB

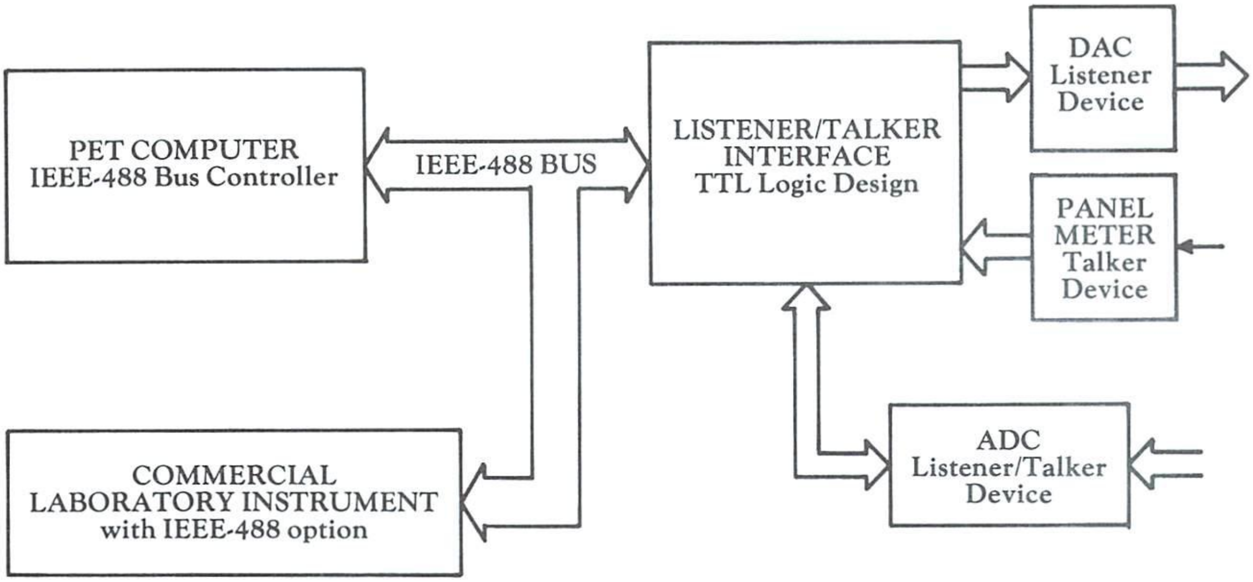
In December 1974 the IEEE Standards Board approved what is now known as *IEEE Standard 488*[9] [10] that describes a general purpose instrument bus (GPIB) for programmable instruments. The GPIB is an improved version of HP-IB (Hewlett-Packard Instrument Bus) used with a family of instruments from Hewlett-Packard Co. GPIB uses a party-line bus structure to which a maximum of 15 devices may be connected. Sixteen signal lines (Figure 2) provide communication of 8-bit commands and data bytes between a bus controller (such as PET) and "listener" and/or "talker" devices connected to the bus via a standard cable.

SRL APPLICATIONS

The versatility of the PET computer/GPIB controller makes it a cost-effective solution to many SRL instrumentation problems (Figure 3). Although our problems encompass a variety of widely different requirements and constraints, one (and sometimes all three) of the PET interface ports can be used to connect the PET to real-time I/O peripheral devices.

A simple application uses a PET and the IEE-488 bus to control two commercial devices, an Aston* event scaler and a printer. Events from a gamma ray detection system are automatically counted; sample concentration of Krypton-85 is computed; a formal test report is printed. All programming is in BASIC. Data are also archived on cassette tape so that a more complex data processing program on selected data could be run on the PET later.

FIGURE 2. PET Computer Connected to IEEE-488 Bus



---

* The Aston Company, Atlanta, GA.

A system has been designed and partially implemented to control and collect data, compute results, and print reports on information from a Princeton Applied Research* (PAR) electrochemical instrument. The complete system will use GPIB and the memory I/O expansion ports of the PET. Currently, PET monitors and controls a PAR 179/173D instrument and a digital panel meter and an ICS 4883 parallel data coupler. A 9K byte BASIC program operates the system. At a future date, high speed data from a PAR 174 instrument will be monitored by PET over a "direct memory access" channel into the I/O expansion port.

Future applications currently in development phase will use PET with a microprocessor-based analog data acquisition subsystem on the GPIB.

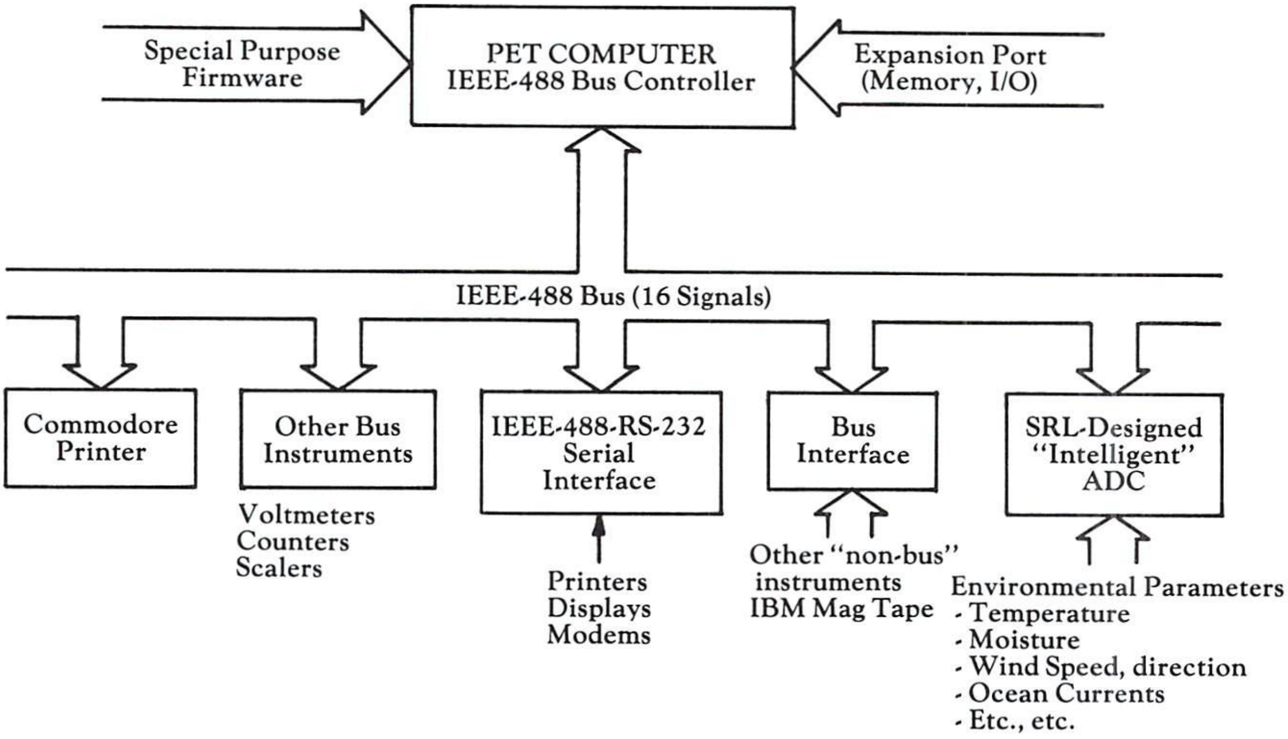
CONCLUSIONS

PET computers are inexpensive, effective GPIB bus controllers. Using GPIB instruments, in-house engineering development is minimized, and therefore, reduces systems cost and implementation time. BASIC programming is easy and final system program is usually written by the experimenter; engineering support will provide I/O subprograms either in BASIC or machine language.

REFERENCES

1. J.S. Byrd. *A Desk-Top Microcomputer*. Thesis, University of South Carolina, Columbia, SC (1973).
2. J.S. Byrd. "When Your System's Data Rates Differ, It's Time for a Microprocessor." *EDN*, pp 57-62 (November 20, 1974).
3. J.S. Byrd. "Microcomputer-Based Control and Data Collection for a Mass Spectrometer." *Applied Spectroscopy*, Vol. 30, No. 1, pp 27-31 (Jan/Feb, 1976).
4. J.S. Byrd, R.J. Sand. *Microcomputer-Based Pneumatic Controller for Neutron Activation Analysis*. USERDA Report DP-1439, E.I. duPont de Nemours and Company, Savannah River Laboratory, Aiken, SC (1976).
5. R.J. Sand. *SRL/6800 Microprocessor Hardware Manual*. USDOE Report DPSTM-DC-1, E.I. duPont de Nemours and Company, Savannah River Laboratory, Aiken, SC (1979).
6. *Hardware Manual, MCS6500 Microcomputer Family*, Second Edition. MOS Technology, Inc., Norristown, PA (1976).
7. *PET 2001-8 Personal Computer User Manual*, First Edition. Commodore Business Machines, Inc., Palo Alto, CA (1978).
8. *Programming Manual, MCS6500 Microcomputer Family*, Second Edition. MOS Technology, Inc., Norristown, PA (1975).
9. *IEEE Standard Digital Interface for Programmable Instrumentation, IEEE Std 488-1978* (revision of *ANSI/IEEE Std 488-1975*), The Institute of Electrical and Electronics Engineers, Inc., New York, NY (1978).
10. Jim McDermott. "The IEEE 488 Bus Plays a Major Role in Programmable Instrument Systems." *Electronic Design 24*, pp 76-80 (November 22, 1976).
11. D.C. Loughry, M.S. Allen. "IEEE Standard 488 and Microprocessor Synergism." *Proceedings of the IEEE*. Vol. 66, No. 2, pp 162-171 (February, 1978).
12. Daniel Levasseur. "Simplify IEEE-488 Implementation with a Multifunction Interface." *EDN*, pp 105-113 (March 5, 1979).
13. John Pieper, R.J. Grossi. "LSI Streamlines Instrument Interface with Standard IEEE-488 Bus." *Electronics*, pp 145-150 (April 26, 1979).

FIGURE 3.


Special Purpose Firmware
PET COMPUTER IEEE-488 Bus Controller
Expansion Port (Memory, I/O)
IEEE-488 Bus (16 Signals)
Commodore Printer
Other Bus Instruments
Voltmeters
Counters
Scalers
IEEE-488-RS-232 Serial Interface
Printers
Displays
Modems
Bus Interface
Other "non-bus" instruments
IBM Mag Tape
SRL-Designed "Intelligent" ADC
Environmental Parameters
- Temperature
- Moisture
- Wind Speed, direction
- Ocean Currents
- Etc., etc.

* Princeton Applied Research Corp., Box 2565, Princeton, NJ 08540.

NEECO

PROUDLY ANNOUNCES THE NEWEST PET MICROCOMPUTERS BY COMMODORE!

PET 2001 — 32K

commodore
PET
2001 Series
personal computer

NEW!

The PET™ is now a truly sophisticated Business System with the announcement of these Peripherals.

The PET™ incorporated with the Floppy Disk and Printer makes an ideal business system for most professional and specialized fields: medicine, law, dental, research, engineering, toolmaking, printing, education, energy conservation, etc. — The PET™ Business System as a management tool delivers information to all levels of Business previously attainable only with equipment many times more expensive. The PET™ Business System is one of the most cost efficient business tools today. It offers a wide range of applications from logging management strategy in major corporations to organizing accounts and inventory control of small businesses. Here are just a few of the cost-saving uses in the corporation, professional office or small business: stock control, purchasing, forecasting, manufacturing costing, customer records, mailing lists, etc. — The PET™ Floppy Disk and Printer, a compatible business system at a reasonable price — Take a closer look at these Peripherals.

PRODUCT	DESCRIPTION	PRICE	AVAILABILITY
PET 2001—4K	4K RAM	$ 595	IMMEDIATE
PET 2001—8K	8K RAM	$ 795	IMMEDIATE
PET 2001—16KN (Large Keys)	16K RAM*	$ 995	IMMEDIATE
PET 2001—32KN (Large Keys)	32K RAM	$1295	IMMEDIATE
PET 2023 PRINTER	ROLL FEED	$ 850	IMMEDIATE
PET 2022 PRINTER	TRACTOR/ROLL	$ 995	IMMEDIATE
PET 2040A	SINGLE FLOPPY	$ 895	JUNE/JULY
PET 2040	DUAL FLOPPY*	$1295	IMMEDIATE
PET C2N	2nd Cassette	$ 100	IMMEDIATE

*The 16K/32K (large keyboard) units do not include a cassette drive. Order C2N Cassette. 2040 Floppy Drive requires a 16K or 32K unit. 8K RAM Retrofit available July.

LARGE TYPEWRITER KEYBOARDS NOW AVAILABLE!

ALL UNITS ARE FULLY TESTED BY NEECO BEFORE SHIPMENT. ALL PET'S ARE WARRANTEED (BY NEECO) FOR 1 FULL YEAR! NEECO IS A FULL CUSTOMER-ORIENTED BUSINESS. PLEASE CALL FOR ADDITIONAL INFORMATION. ALL UNITS ARE IN STOCK & READY TO SHIP. FULL SOFTWARE AVAILABLE!

COMPUTHINK .4 & .8 MEGABYTE DISK DRIVES FOR THE NEW 16/32K PETS!

DISK SYSTEMS INCLUDE DISKMON OPERATING SYSTEM IN ROM AND INTERFACE TO 16/32 PETS!

- Dual Minifloppy Drives with 200K per diskette side for total 400K/800K on line
- 800K model accesses all 4 diskette sides via dual read and write arm system
- Dual Density Hardware and DOS loads 20K (with verification) in 4.2 seconds complete
- DISKMON (DOS) adds 17 commands to BASIC including Random Access and printer support
- System comes complete with plug in internal board containing 8K RAM, DOS, and Disk Controller Hardware—Board plugs directly onto internal memory expansion pins
- System does not utilize IEEE or USER Port, system functions directly from memory port
- All DISKMON DOS commands reside interactively with BASIC—disk directory command and format command do not interfere with program in RAM—DOS command were designed for simplicity of use. System was manufactured for heavy commercial use
- System installs completely in less than ten minutes—immediately ready for use
- **$1295** and **$1595** prices include all hardware, DOS, complete user manual, and demo/utility diskette
- Available software includes PLM Compiler (**$250**), Relocatable Assembler (**$70**), Source-Editor Program (**$70**), Autolink Linking Loader (**$70**), and a complete Database system (Pagemate **$495**)
- Call or write for complete product information and specifications—User manual **$10**

FOR 8K PETS
(small keyboards)
.4 Megabytes of Disk
Storage for 8K PETS!
(Requires Expandamem)
400K-8S DISK SYSTEM INCLUDES RANDOM ACCESS IN DOS-LOADS 20K IN 4 SECONDS!
24K Expandamem Memory $525
32K Expandamem Memory $615
$1295

(PRODUCT AVAILABILITY IS AUG/SEPT—CALL FOR INFO)

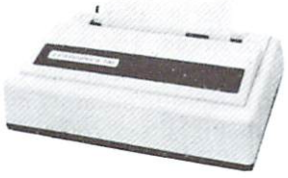
ALL 16/32K MODELS INCLUDE AN INTERNAL PLUG-IN INTERFACE BOARD CONTAINING DOS, 8K OF RAM, AND CONTROLLER

400K-16N **$1295**
400K-32N **$1295**
800K-16N **$1595**
800K-32N **$1595**

CALL OR WRITE FOR A FREE COPY OF OUR NEW JULY CATALOG!

NEW CENTRONICS 730 PRINTER FOR PET!

• NEWEST TECHNOLOGY FROM CENTRONICS • 50 CPS • 80 CHARACTER LINE • 10 CPI • 7x7 DOT MATRIX • HANDLES ROLL FEED, PIN FEED PAPER • UPPER & LOWER CASE—**$1099** PRICE INCLUDES INTERFACE TO IEEEPORT. AVAILABLE AUG/SEPT.



$1099

TRS-80 USERS!-THE MODEL 730 IS AVAILABLE FOR USE WITH THE TRS-80. PRICE INCLUDES CABLE only **$995**

WE CANNOT LIST ALL OF OUR SOFTWARE AND HARDWARE PRODUCTS
CALL OR WRITE FOR OUR *FREE* SOFTWARE/HARDWARE DIRECTORY

ALL NEECO PETS CARRY A FULL ONE-YEAR NEECO WARRANTEE.

NEECO

NEW ENGLAND ELECTRONICS CO., INC.
679 HIGHLAND AVE., NEEDHAM, MASS. 02194
MON. - FRI. 9:30 - 5:30, EST.

(617) 449-1760
MASTERCHARGE OR VISA ACCEPTED
TELEX NUMBER 951021, NEECO

COMPUTE. Dealers As Of September 11, 1979

American Peripherals
3 Bangor Street
Lindenhurst, NY 11757

Apple T.V. & Computing
2606 S. Robertson Blvd.
Los Angeles, CA 90034

Atlanta Computer Mart
5091 Buford Highway
Atlanta, GA 30340

Barney Miller's, Inc.
232 East Main Street
Lexington, KY 40507

Byte Shop
6041 Greenback Lane
Citrus Heights, CA 95610

Byte Shop #1
1415 West El Camino
Mountain View, CA 94040

Byte Shop/Brentwood
11611 San Vicente Blvd.
Los Angeles, CA 90049

Byte Shop
218 N. Elm Street
Greensboro, NC 27401

Byte Shop of Raleigh
1213 Hillsborough Street
Raleigh, NC 27603

Byte Shop of Milwaukee
6019 W. Layton Avenue
Greenfield, WI 53220

Computer Age, Inc.
4688 Convoy Street, Suite 105
San Diego, CA 92111

Computer Center
302 Commercial Street
Waterloo, Iowa 50701

Computer Center of South Bend
51591 US 31 N
South Bend, IN 46637

Computer Concepts
1401 East Lincolnway
Cheyenne, WY 82001

Computer Country
235 Dunn Road
Florissant, MO 63031

Computer Forum
14052 E. Firestone Blvd.
Santa Fe Springs, CA 90670

Computer Nook
Route 46, Pine Brook Plaza
Pine Brook, NJ 07058

Computer Shoppe, Inc.
3225 Danny Park
Metairie, LA 70002

Computer World
6791 Westminster Avenue
Westminster, CA 92683

Computerland
2992 Navajo Road
El Cajon, CA 92020

Computerland of Santa Maria
223 S. Broadway
Santa Maria, CA 93454

Computers For You
3608 West Broward Blvd.
Ft. Lauderdale, FL 33312

The Corner Computer Store
900-902 Spring Garden Street
Greensboro, NC 27403

Home Computers
1775 Tropicana #2
Liberace Plaza
Las Vegas, NV 89109

Computerland
1500 South 336th Street
Suite 12
Federal Way, WA 98003

Computerland/Milwaukee
10111 W. Capitol Drive
Milwaukee, WI 53222

Kappel's Computer Store, Inc.
125 E. Main Street
Belleville, ILL 62220

Madison Computer Store
1825 Monroe Street
Madison, WI 53711

Micro Mini Computer World
Town & Country Shopping Ct.
74 Robinwood
Columbus, OH 43213

Millet's Micro Com
621 E. Broadway
Mesa, AZ 85204

Mr. Calculator, Inc.
39 Town & Country Village
Palo Alto, CA 94301

PC Computers
10166 San Pablo Avenue
El Cerrito, CA 94530

Personal Computer Center
3819 West 95th Street
Overland Park, KS 66206

Personal Computers, Inc.
South 104 Freya
Spokane, WA 99202

CANADA

Home Computer Centre
6101 Yonge Street
Willowdale, Ontario
M2M 3W2 CANADA

House of Computers
368 Eglington Ave. W.
Toronto, Ontario
M5N 1A2 CANADA

Kobetek Systems Limited
RR #1
Wolfville, Nova Scotia
B0P 1X0 CANADA

A Warning:

The **MacroTeA**™ is for Professional Programmers — and Very Serious Amateurs — Only

Now: a machine language programming powerhouse for the knowledgeable programmer who wants to extend the PET's capabilities to the maximum. The MacroTeA, the Relocating Macro Text Editor:Assembler from Skyles Electric Works.

The Skyles MacroTeA is a super powerful text editor. 26 powerful editing commands. String search and replace capability. Manuscript feature for letters and other text. Text loading and storage on tape or discs. Supports tape drives, discs, CRT, printers and keyboard.

The Skyles MacroTeA is a relocating machine language assembler with true macro capabilities. A single name identifies a whole body of lines. You write in big chunks, examine, modify and assemble the complete program. And, when loading, the MacroTeA goes where you want it to go. Macro and conditional assembly support. Automatic line numbering. Labels up to 10 characters long.

The Skyles MacroTeA is an enhance Monitor. 11 powerful commands to ease you past the rough spots of program debugging.

The Skyles MacroTeA is a warm start button. Over 1700 bytes of protected RAM memory for your object code.

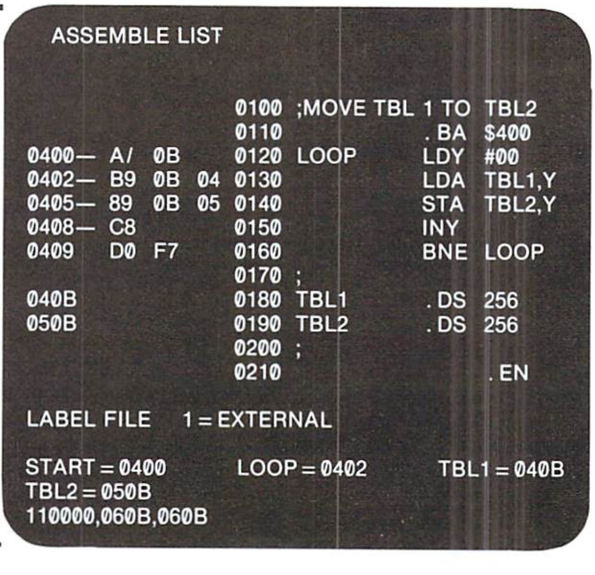
There's no tape loading and no occupying of valuable RAM memory space: The Skyles MacroTeA puts 10K bytes of executable *machine language* code in ROM (from 9800 to BFFF — directly below the BASIC interpreter). 2K bytes of RAM (9000 to 97FF).

Like all Skyles Products for the PET, it's practically **plug in and go.** No tools are needed. And, faster than loading an equivalent size assembler/editor from tape, the MacroTeA is installed permanently.

The Skyles MacroTeA: *13 chips on a single PCB. Operates interfaced with the PET's parallel address and data bus or* with the Skyles Memory Connector. (When ordering, indicate if the MacroTeA will interface with a Skyles Memory Expansion System. You can save $20.) Specifications and engineering are up to the proven Skyles quality standards. Fully warranted for 90 days. And, as with all Skyles products, fully and intelligently documented.

VISA, Mastercharge orders call (800) 227-8398 (Except Calif.)
California orders please call (415) 494-1210.

Skyles Electric Works
10301 Stonydale Drive, Cupertino, CA 95014, (408) 735-7891



```
ASSEMBLE LIST

                    0100 ;MOVE TBL 1 TO TBL2
                    0110                . BA  $400
0400— A/  0B        0120 LOOP           LDY   #00
0402— B9  0B  04    0130                LDA   TBL1,Y
0405— 89  0B  05    0140                STA   TBL2,Y
0408— C8            0150                INY
0409  D0  F7        0160                BNE   LOOP
                    0170 ;
040B                0180 TBL1           . DS  256
050B                0190 TBL2           . DS  256
                    0200 ;
                    0210                      . EN

LABEL FILE    1 = EXTERNAL

START = 0400        LOOP = 0402        TBL1 = 040B
TBL2 = 050B
110000,060B,060B
```

Tokens Aren't Just for Subways — A Convenient Method to List Microsoft BASIC Tokens

Harvey B. Herman
Chemistry Department
University of North Carolina at Greensboro
Greensboro, North Carolina 27412

The latest buzzword in computer circles is "Tokens." I have even heard the verb "tokanize" used in casual conversation. However, my observation is that many people are still confused about the meaning of this term and would like to learn more. How do you explain to someone looking at the table on p. 8 of the Spring 1979 issue of the PET Gazette (list compiled by Jim Butterfield) why, for example, a decimal 161 in memory can have four or more different meanings, including the three letter BASIC key word GET? This article is intended to clear up some of the confusion (I hope) and to illustrate a convenient method to list all the tokens in various versions of Microsoft BASIC (PET, KIM, SYM, etc.).

Understanding tokens is not just an idle exercise. Useful programs have begun to appear which use "token knowledge" for specific purposes. For example, Len Lindsay (our indefatigable editor) recently published (The PET Gazette, Summer, 1979, p. 10) a program to identify PEEK and POKE in BASIC programs so they can be more easily converted to run on PETs with new ROMs. This program searches memory for the PEEK and POKE tokens and would not work unless these values are known. Other Microsoft BASICs have similar, but *not* identical, lists of tokens. To use the Lindsay program on other computers it probably would be necessary to change the token values. A BASIC program to list PET tokens is shown and discussed below.

```
 128 REM 80
 129 REM 81
 130 REM 82
 131 REM 83
 132 REM 84
 133 REM 85
 134 REM 86
 135 REM 87
 136 REM 88
 137 REM 89
 138 REM 8A
 139 REM 8B
 140 REM 8C
 141 REM 8D
  .
  .
  .
 168 REM A8
 169 REM A9
 170 REM AA
 171 REM AB
 172 REM AC
 173 REM AD
 174 REM AE
 175 REM AF
 176 REM B0
 177 REM B1
 178 REM B2
 179 REM B3
 180 REM B4
 181 REM B5
 182 REM B6
 183 REM B7
 184 REM B8
 185 REM B9
 186 REM BA
 187 REM BB
 188 REM BC
 189 REM BD
 190 REM BE
 191 REM BF
 192 REM C0
 193 REM C1
 194 REM C2
 195 REM C3
 196 REM C4
 197 REM C5
 198 REM C6
 199 REM C7
 200 REM C8
 201 REM C9
 202 REM CA
 500 REM OPEN 5,4:CMD 5
 510 FOR I=1 TO 667 STEP 9:REM 667(9*#TOKENS-8)
 520 J=J+1
 530 POKE 1028+I,127+J:REM 1028(START OF PROGRAM STORAGE+4)
 540 NEXT I
 550 LIST 128-202: REM 202(127+#TOKENS)
 560 REM PRINT#5:CLOSE5
READY.
```

Is Programming Fun?

Have More Fun, Make Fewer Errors, Complete Programs Much Faster... with the **BASIC PROGRAMMER'S TOOLKIT™**

Now you can modify, polish, simplify, add new features to your PET programs far more quickly while reducing the potential for error. That all adds up to more fun . . . and the **BASIC Programmer's ToolKit.**

The magic of the ToolKit: 2KB of ROM firmware on a single chip with a collection of machine language programs available to you from the time you turn on your PET to the time you shut if off. No tapes to load or to interfere with any running programs. And the **Programmer's ToolKit** installs in minutes, without tools.

Here are the 10 commands that can be yours instantly and automatically ... *guaranteed* to make your BASIC programming a pleasure:

AUTO **RENUMBER** **DELETE**
HELP **TRACE** **STEP**
OFF **APPEND** **DUMP**
FIND

Every one a powerful command to insure more effective programming. Like the **HELP** command that shows the line on which the error occurs ... and the erroneous portion is indicated in reverse video:

HELP
500 J = SQR(A*B/C)
READY

... Or the **TRACE** command that lets you see the sequence in which your program is being executed in a window in the upper corner of your CRT:

TRACE #100
#110
READY. #150
RUN

The **Programmer's ToolKit** is a product of Harry Saal and his associates at Palo Alto ICs.

So, if you really want to be into BASIC programming — and you want to have fun while you're doing it, order your **BASIC Programmer's Toolkit** now. We guarantee you'll be delighted with it.

To Order PROGRAMMER'S TOOLKIT or MACROTEA —

Custom designed to plug into your PET. So, when ordering, please indicate if your Toolkit:

...will be used with the Skyles Memory Expansion System, or	$80.00*
...will be used with the ExpandaPet, or Expandmem	$80.00*
...will be used with the PET 2001-8 alone *(We furnish connectors to the memory expansion bus and to the second cassette interface.*	$80.00*
...will be used with the PET 2001-16, -32 (chip only)	$50.00*
...will be used with Skyles MacroTeA	$50.00*

Your MacroTeA. Custom designed for your PET. So specify your PET model when ordering. $395.00*

(Important Savings: If it's to be used with a Skyles Memory Expansion System, the **MacroTeA** can plug directly into the Skyles connector. **So you save $20.** The Skyles **MacroTeA** is only **$375.00 when interfaced with the Skyles Memory Expansion System.)**

Send your check or money order to Skyles Electric Works. VISA, Mastercharge orders may call (800) 227-8398. (California residents: please phone (415) 494-1210.)

Ten Day Unconditional Money-Back Guarantee on all products sold by Skyles Electric Works, except chip only.

California residents: please add 6-6½% California sales tax.

Skyles Electric Works 10301 Stonydale Drive, Cupertino, CA 95014, (408) 735-7891

The program can be adapted to other BASICs with only few changes (underlined). Before proceeding to that discussion a few words about tokens are in order. The concept underlying tokens is not difficult to understand. Programs are not stored exactly as they are typed in. Instead of storing all the characters in the keyword PRINT, for example, PET Microsoft BASIC stores only one 8 bit character, decimal value 153. This saves storage space and speeds up execution of programs. All the tokens are greater than 127, i.e., their hexadecimal value has its most significant bit (MSB) set. The BASIC interpreter can rapidly identify the tokens by checking the MSB and jumping to the appropriate subroutine.

The number of tokens in a given BASIC depends on the number of commands and functions which have been implemented. In a recent article on tokens (MICRO 15:20) a list for OSI BASIC was included which showed 68 tokens (for comparison PET has 75). Also, the PRINT token had the decimal value of 151 (PET uses 153). These facts are cited to emphasize the importance of modifying programs which PEEK at memory for particular tokens when transferring them to other computers. The values may accidentally agree but don't count on it.

Listing (Below) With Output

```
             128 END 80          168 NOT A8
             129 FOR 81          169 STEP A9
             130 NEXT 82         170 + AA
             131 DATA 83         171 - AB
             132 INPUT# 84       172 * AC
             133 INPUT 85        173 / AD
             134 DIM 86          174 ^ AE
             135 READ 87         175 AND AF
             136 LET 88          176 OR B0
             137 GOTO 89         177 > B1
             138 RUN 8A          178 = B2
             139 IF 8B           179 < B3
             140 RESTORE 8C      180 SGN B4
             141 GOSUB 8D        181 INT B5
142 REM 8E   142 RETURN 8E       182 ABS B6
143 REM 8F   143 REM 8F          183 USR B7
144 REM 90   144 STOP 90         184 FRE B8
145 REM 91   145 ON 91           185 POS B9
146 REM 92   146 WAIT 92         186 SQR BA
147 REM 93   147 LOAD 93         187 RND BB
148 REM 94   148 SAVE 94         188 LOG BC
149 REM 95   149 VERIFY 95       189 EXP BD
150 REM 96   150 DEF 96          190 COS BE
151 REM 97   151 POKE 97         191 SIN BF
152 REM 98   152 PRINT# 98       192 TAN C0
153 REM 99   153 PRINT 99        193 ATN C1
154 REM 9A   154 CONT 9A         194 PEEK C2
155 REM 9B   155 LIST 9B         195 LEN C3
156 REM 9C   156 CLR 9C          196 STR$ C4
157 REM 9D   157 CMD 9D          197 VAL C5
158 REM 9E   158 SYS 9E          198 ASC C6
159 REM 9F   159 OPEN 9F         199 CHR$ C7
160 REM A0   160 CLOSE A0        200 LEFT$ C8
161 REM A1   161 GET A1          201 RIGHT$ C9
162 REM A2   162 NEW A2          202 MID$ CA
163 REM A3   163 TAB( A3
164 REM A4   164 TO A4          READY.
165 REM A5   165 FN A5
166 REM A6   166 SPC( A6
167 REM A7   167 THEN A7
```

The program shown is loaded and run normally. It converts the REM tokens in statements 128 to 202 (PET version) to the correspondingly numbered token and terminates with a list of the tokens and their decimal and hexadecimal equivalents. Note the program will not run a second time with a simple RUN command as the first REM has been replaced with an END (try RUN 500 instead). The PET version can be listed on a printer, if available, by deleting the REM in statement 500 and properly closing the file after the program ends.

If you are using this program on another computer (KIM or SYM) the number of tokens will need to be changed. The proper value can be found by trial and error. When the number of tokens is less an error will be printed when the list in statement 550 attempts to print an invalid token. The number of the last printed token is used to correct statement 550. The REM comments will help in locating other statements which use the number of tokens and need correction. When the number of tokens is greater than the PET, more initial REMs should be added (203 and above), and the number of tokens increased appropriately until an invalid token causes an error message as above.

Whatever computer is being used the list of tokens should be kept handy as it is an invaluable aid in understanding and modifying programs written for other systems.

Review

DC Hayes Micro Modem $395.00

Michael Tulloch
103 White Cr.
Niceville, Fla. 32578

Manufacturer
10 Perimeter Park Drive
Atlanta, GA 30341

I've been using a D.C. Hayes MicroModem for several months now. If you've ever used a time-share terminal you'll only know about half of what to expect. For those of you who've never time-shared, getting into the world of mainframes is a logical expansion of hobby computing. Owning a modem opens another field too, that of written communication. In addition to being able to access big machines you can type to your friends, interact with telephone bulletin boards and play interactive games.

The DC Hayes MicroModem consists of two parts. One is a PC board which plugs into the Apple (they recommend slot 3). It contains software in ROM to turn your Apple into a dumb terminal. You can even dial from the keyboard.

The other part is a small plexiglass and metal box apparently containing the telephone interface. Since this is an FCC registered device, you just plug it into your phone line. Then call the phone company, tell them you have an FCC registered device, give them the device number and ringer equivalent. There is no extra charge in most cases.

Documentation of this device is excellent. Operating theory, sample programs, good instructions and even a history of modem technology is included. One of the sample programs allows you to call up your Apple (from work?) using a dumb terminal and write programs. This sure is a better way to spend lunch than playing cards! When you get home the program will be ready for you.

Computer to computer links are also possible. Our Tektronix 4051 has a program dump routine which can pass a whole program over its modem. We called my Apple at home and dumped a Tektronix BASIC program to it. The Tektronix displays each line as it is passed. Much to our surprise there appeared rather strange symbols and extraneous letters intermixed on the screen. We finally figured out that the Apple wouldn't accept some of the Tektronix graphic commands and was passing *** SYNTAX ERROR *** back to the 4051. The 4051 was interleaving this on its display. However, when I got home, all Apple syntax compatable lines were loaded in the Apple. The program even ran correctly except, of course, there was no graphic output.

Another nice feature is that there is nothing to assemble. It's just plug in and go. Programs can easily be written which do some very complex things over the telephone. One example Hayes gives is a message relay. You call the Apple and leave a message. The Apple then calls another computer or terminal and relays the message. It keeps trying until it gets through. All aspects of the modem operation are accessible to the programmer so transmission characteristics, number of rings to answer, and so on can be programmed.

At $395.00 the D.C. Hayes modem is a good buy. With all the telephone accessible hobbyists, computer stores, main frames, and club machines on line, you can quickly spend twice the purchase price on long distance telephone calls.

Review

PETSET 1a $295.00

Connecticut Microcomputer, Inc.
150 Pocono Road
Brookfield, Connecticut 06804

Many PET users intend to do more with their computers than just play games. Small computers can do many (but not all) scientific calculations formally done on larger and more expensive computers. Laboratory data in analog form can be fed directly into a small computer using electronic circuits containing analog-to-digital converters. The result of an experiment can be known shortly after the experiment is completed and repeated if necessary. The equipment (PETSET 1A) reviewed here allows PET owners to connect analog data, from several instruments, directly into their PET. No special programming expertise is required of you and neither do you have to be an electronics wizard.

PETSET 1a consists of separate modules which when connected together, and to the PET, make up a 16 channel, 8 bit, analog-to-digital conversion system. I assembled this together in less than five minutes (I'm slow). Connections are made to a screw terminal barrier strip with just a screw driver. I believe the ease of installation will be attractive to potential users.

The software needed to use PETSET 1a is also quite simple: 10 POKE 59426,0 : POKE 59426,255 : ? PEEK (59471) 20 GOTO 10

The above program will sample analog channel 0 repeatedly, as fast as BASIC will allow. There is no need to check for end of conversion (EOC) as the conversion is completed (100 µsec) even before BASIC is ready to check. It should be easy to add statements which bring in data at specified time intervals using the real time clock. With more programming effort experienced users could write a machine language routine which would bring in data even faster than the simple BASIC program above.

PETSET 1a is connected to both the IEEE and User Port. It uses the IEEE port as a simple output control. For example, poking a zero to location 59426 starts conversion on analog channel 0. Digital data is brought in on the User Port by peeking at location 59471 (VIA output register without handshaking). The IEEE port can still be used for other devices such as CMC's printer adapter (ADA 1200) without disconnecting PETSET 1a. Technical specifications are:

16 analog inputs
100 µsec conversion time
0 to +5 V inputs
0 to 255 counts (8 bit conversion)
input current, 2 µamp, max
max error, 0.5% typical

I was generally pleased with the system. However, the packaging is not as compact as I would wish. Some space is required behind the PET to accomodate the modules. A flat surface is also helpful. However, it does perform as advertised and is easy to put together and use. While it is not cheap, it is probably within many people's budgets. This system should definitely be considered if you:

1) want to measure several voltages simultaneously,
2) are satisfied with 8 bit resolution,
3) don't want to spend lots of time with construction or programming.

Reviewed by Harvey B. Herman

Universal 6502 Memory Test

Carl W. Moser

This article contains a memory test program which tests RAM memory in various 6502 based systems. This test was developed after using several tests which did not perform a complete test. The problem areas were untested chip selects and address line inputs.

The program performs two tests:

Test 1: Tests memory cells for storage retention, and open, shorted, or non-functioning data and Ao-An address lines. This is done by writing 00 011 ... FF 00 011 ... FF continually throughout the memory range for the first pass. When this has been written, it is checked to validate the data. On the next pass 01 02 ... FF 00 011 ... FF is written and checked. This continues for 256 (hex FF) passes until all possible combinations of bit patterns have been used.

Test 2: Tests the RAM chip select inputs. This is the same as test 1 except data 00 01 ... F2 00 01 ... F2 is used. The purpose of this test is to test the remaining A_8-A_{15} address lines. Listings 1 (originating at memory address $0002) and 2 (originating at $0800) contain the source of the memory test program. The reason for these two listings is that not all 6502 microcomputers have RAM at a common address from which the memory test program can execute. To determine which listing is appropriate for your system, consult table A. Next enter the object code from the appropriate listing, and then configure the I/O for your system, also from table A.

Enter the start address and end address of the memory range to be tested as described in table B. Execution begins with test 1 at $0002 for Listing 1 and $0800 for Listing 2.

If an error occurs, it will be outputted in the following format:

Address	Test Pattern	Error
xxxx	yy	zz

Note: This program performs a lengthy but exhaustive test of RAM memory. It takes approximately 38 seconds per 1K of memory for each test 1 and test 2.

When test 1 runs to completion, a break instruction will be executed to enter your systems monitor program. Register A will contain E1 indicating end of test 1. To execute test 2, simply continue execution by typing G to your monitor.

If errors occur, they will be of the same form as described above. When test 2 has run to completion, a break instruction will again transfer control to your monitor and register A will contain E2 signifying the end. To continue execution again at test 1, simply type G. The start and end address range is not altered by the memory test program.

If errors occurred in test 2 but not in test 1, you can safely assume a chip select malfunction (possible stuck in enable state or malfunction with circuitry which generates the chip select) or an address line other than A_0-A_7. Usually a number of errors will occur in test 1 when the fault is a single defective address input, data input, or data output.

If a continuous sequence of addresses with errors occur, the problem is likely to be an open data input or a data output stuck at '1' or '0.'

If errors occur every 2nd, 4th, 8th, 16th or some power of 2 address sequence, check for defective address inputs as follows:

Data bit with error	Check address input	Data bit with error	Check address input
D_0	A_0 or A_8	D_4	A_4 or A_{12}
D_1	A_1 or A_9	D_5	A_5 or A_{13}
D_2	A_2 or A_{10}	D_6	A_6 or A_{14}
D_3	A_3 or A_{11}	D_7	A_7 or A_{15}

If, for example, you are checking 2102's (1x1K) and are specifying a 4K range of memory and an error common to the whole range occurs, the problem is likely to be in the power leads, defective data or address buffers, stuck at '0' address inputs, stuck at '0' data inputs, or stuck at '0' data outputs.

In all of the above, you may have to examine the various memory error patterns for some similarity in order to isolate the defective component. This is especially true of the 1x1K 2102, and 1x16K 4116 memory chips where each chip is devoted to a particular data lead (D_0-D_7).

```
TEST 2          TEST 1
                                  ;          MCS 6502 MEMORY TEST
                                  ;ZERO PAGE LOCATIONS
                                  ADDRS      .DE 0 ;2 BYTES - ADDRESS OF
                                                                 MEMORY
                                             .BA $0002 OR  .BA $0800
0800- A2 00     0002- A2 00       MEM<TEST   LDX #$00
0802- 8E E2 08  0004- 8E E4 00               STX TEST<TYPE         ; TEST 1
0805- 20 1B 08  0007- 20 1D 00               JSR TEST<PGM
0808- A9 E1     000A- A9 E1                  LDA #$E1
080A- 00        000C- 00                     BRK
080B- EA        000D- EA                     NOP
080C- EA        000E- EA                     NOP
080D- EE E2 08  000F- EE E4 00               INC TEST<TYPE         ; TEST 2
0810- 20 1B 08  0012- 20 1D 00               JSR TEST<PGM
0813- A9 E2     0015- A9 E2                  LDA #$E2
0815- 00        0017- 00                     BRK
0816- EA        0018- EA                     NOP
0817- EA        0019- EA                     NOP
0818- 4C 00 08  001A- 4C 02 00               JMP MEM<TEST
                                  ;
081B- 20 C9 08  001D- 20 CB 00    TEST<PGM   JSR CRLF
081E- A0 00     0020- A0 00                  LDY #$00       ; PATTERN REGISTER
0820- A2 00     0022- A2 00                  LDX #$00
0822- 8E E1 08  0024- 8E E3 00               STX TEST<PATRN
0825- 4C 2E 08  0027- 4C 30 00               JMP NX<PASS
                                  ;
0828- EE E1 08  002A- EE E3 00    NX<PATRN   INC TEST<PATRN
082B- D0 01     002D- D0 01                  BNE NX<PASS
082D- 60        002F- 60                     RTS
082E- AC E1 08  0030- AC E3 00    NX<PASS    LDY TEST<PATRN
0831- 20 9F 08  0033- 20 A1 00               JSR INI<ADDRS
0834- 98        0036- 98          LOOP1      TYA
0835- 81 00     0037- 81 00                  STA (ADDRS,X)    ; STORE PATTERN
0837- C1 00     0039- C1 00                  CMP (ADDRS,X)    ; CHECK
0839- F0 03     003B- F0 03                  BEQ NO<ERR1
083B- 20 81 08  003D- 20 83 00               JSR ERROR ; ADDRS, R(A),(ADDRS,X)
083E- 20 6E 08  0040- 20 70 00    NO<ERR1    JSR INC<ADDRSC
0841- F0 06     0043- F0 06                  BEQ CK<PATRN
0843- 20 61 08  0045- 20 63 00               JSR INC<RY
0846- 4C 34 08  0048- 4C 36 00               JMP LOOP1
                                  ;
0849- AC E1 08  004B- AC E3 00    CK<PATRN   LDY TEST<PATRN
084C- 20 9F 08  004E- 20 A1 00               JSR INI<ADDRS    ; INITIALIZE ADDRS
084F- 98        0051- 98          LOOP2      TYA
0850- C1 00     0052- C1 00                  CMP (ADDRS,X)
```

```
0852- F0 03     0054- F0 03      0560             BEQ NO<ERR2
0854- 20 81 08  0056- 20 83 00   0570             JSR ERROR   ; ADDRS,R(A),(ADDRS,X)
0857- 20 61 08  0059- 20 63 00   0580 NO<ERR2     JSR INC<RY
085A- 20 6E 08  005C- 20 70 00   0590             JSR INC<ADDRSC
085D- D0 F0     005F- D0 F0      0600             BNE LOOP2
085F- F0 C7     0061- F0 C7      0610             BEQ NX<PATRN
0861- C8        0063- C8         0640 INC<RY      INY
0862- AD E2 08  0064- AD E4 00   0650             LDA TEST<TYPE
0865- F0 06     0067- F0 06      0660             BEQ EXIT1
0867- C0 F3     0069- C0 F3      0670             CPY #$F3  ; RESET R(Y) TO CHECK
0869- 90 02     006B- 90 02      0680             BCC EXIT1             CHIP SELECTS
086B- A0 00     006D- A0 00      0690             LDY #$00
086D- 60        006F- 60         0700 EXIT1       RTS
                                 0710 ;
                                 0720 ;
086E- E6 00     0070- E6 00      0730 INC<ADDRSC  INC *ADDRS
0870- D0 02     0072- D0 02      0740             BNE SKIP<HI
0872- E6 01     0074- E6 01      0750             INC *ADDRS+$01
0874- AD DF 08  0076- AD E1 00   0760 SKIP<HI     LDA END
0877- C5 00     0079- C5 00      0770             CMP *ADDRS
0879- D0 05     007B- D0 05      0780             BNE EXIT2
087B- AD E0 08  007D- AD E2 00   0790             LDA END+$01
087E- C5 01     0080- C5 01      0800             CMP *ADDRS+$01
0880- 60        0082- 60         0810 EXIT2       RTS
                                 0840 ;OUTPUT THE ERROR; ADDRESS, PATTERN, ERROR
0881- 48        0083- 48         0850 ERROR       PHA
0882- A5 01     0084- A5 01      0860             LDA *ADDRS+$01
0884- 20 AA 08  0086- 20 AC 00   0870             JSR TBYT     ; OUTPUT ADDRS HI
0887- A5 00     0089- A5 00      0880             LDA *ADDRS
0889- 20 AA 08  008B- 20 AC 00   0890             JSR TBYT     ; OUTPUT ADDRS LO
088C- 20 D4 08  008E- 20 D6 00   0900             JSR SPACE2
088F- 68        0091- 68         0910             PLA
0890- 20 AA 08  0092- 20 AC 00   0920             JSR TBYT     ; OUTPUT PATTERN
0893- 20 D4 08  0095- 20 D6 00   0930             JSR SPACE2
0896- A1 00     0098- A1 00      0940             LDA (ADDRS,X)
0898- 20 AA 08  009A- 20 AC 00   0950             JSR TBYT     ; OUTPUT ERROR IN MEMORY
089B- 20 C9 08  009D- 20 CB 00   0960             JSR CRLF
089E- 60        00A0- 60         0970             RTS
                                 0980 ;
                                 0990 ;
                                 1000 ;INITIALIZE ADDRS WITH START
089F- AD DD 08  00A1- AD DF 00   1010 INI<ADDRS   LDA START
08A2- 85 00     00A4- 85 00      1020             STA *ADDRS
08A4- AD DE 08  00A6- AD E0 00   1030             LDA START+$01
08A7- 85 01     00A9- 85 01      1040             STA *ADDRS+$01
08A9- 60        00AB- 60         1050             RTS
                                 1060 ;
                                 1070 ;
                                 1080 ;ROUTINE TO OUTPUT A BYTE
08AA- 48        00AC- 48         1090 TBYT        PHA
08AB- 4A        00AD- 4A         1100             LSR A
08AC- 4A        00AE- 4A         1110             LSR A
08AD- 4A        00AF- 4A         1120             LSR A
08AE- 4A        00B0- 4A         1130             LSR A
08AF- 20 B3 08  00B1- 20 B5 00   1140             JSR NIBBLE
08B2- 68        00B4- 68         1150             PLA
08B3- 29 0F     00B5- 29 0F      1160 NIBBLE      AND #$0F
08B5- 09 30     00B7- 09 30      1170             ORA #$30
08B7- C9 3A     00B9- C9 3A      1180             CMP #$3A
08B9- 90 02     00BB- 90 02      1190             BCC WRITE
08BB- 69 06     00BD- 69 06      1200             ADC #$06
                                 1210

                                 1220 ;ROUTINE TO WRITE AN ASCII CHAR.
08BD- 8C E3 08  00BF- 8C E5 00   1230 WRITE       STY SAVEY
08C0- EA        00C2- EA         1240 ROM.LINK    NOP
08C1- EA        00C3- EA         1250             NOP
08C2- EA        00C4- EA         1260             NOP
08C3- EA        00C5- EA         1270             NOP
08C4- EA        00C6- EA         1280             NOP
08C5- AC E3 08  00C7- AC E5 00   1290             LDY SAVEY
08C8- 60        00CA- 60         1300             RTS
                                 1310
                                 1320 ;ROUTINE TO OUTPUT CRLF
08C9- A9 0D     00CB- A9 0D      1330 CRLF        LDA #$0D
08CB- 20 BD 08  00CD- 20 BF 00   1340             JSR WRITE
08CE- A9 0A     00D0- A9 0A      1350             LDA #$0A
08D0- 20 BD 08  00D2- 20 BF 00   1360             JSR WRITE
08D3- 60        00D5- 60         1370             RTS
                                 1380
                                 1390 ;SPACE2 = OUTPUT 2 SPACES
                                 1400 ;SPACE  = OUTPUT 1 SPACE
08D4- 20 D7 08  00D6- 20 D9 00   1410 SPACE2      JSR SPACE
08D7- A9 20     00D9- A9 20      1420 SPACE       LDA #'
08D9- 20 BD 08  00DB- 20 BF 00   1430             JSR WRITE
08DC- 60        00DE- 60         1440             RTS
                                 1450
                                 1460
08DD-           00DF-            1470 START       .DS 2 ;USER ENTERS START OF MEMORY RANGE
08DF-           00E1-            1480 END         .DS 2 ;USER ENTERS END OF MEMORY RANGE
                                 1490
08E1-           00E3-            1500 TEST<PATRN .DS 1         ;CURRENT TEST PATTERN
08E2-           00E4-            1510 TEST<TYPE  .DS 1         ;=1,2 FOR TEST TYPE
08E3-           00E5-            1520 SAVEY       .DS 1         ;SAVE R(Y)
                                 1530
                                 1540
                                 1550 END.PGM     .EN
```

TABLE A

Computer	Use Listing	Enter at ROM LINK: 00C2 for Listing 1 08C0 for Listing 2
PET	2	20 D2 FF
APPLE II	2	09 80 20 ED FD
SYM	1 or 2	20 63 A6
KIM	1	20 A0 IE
TIM	1 or 2	20 C6 72
OSI 65D	2	20 0B FE
Western Data Systems	2	20 A5 FC
ATARI	?	?
AIM	?	?
Super KIM	?	?

TABLE B

	Listing 1	Listing 2
Start Address lo	00DF	08DD
Start Address hi	00E0	08DE
End Address lo	00E1	08DF
End Address hi	00E2	08E0
Execution Address	0002	0800

Statement 140: $0002 For Test 1
$0800 For Test 2

Universal 6502 Memory Test
EASTERN HOUSE SOFTWARE
Carl W. Moser
3239 Linda Drive
Winston-Salem, NC 27106

Microcomputers In Education

by
Pierre P. Barrette
Assistant Professor Information Science
Department of Curriculum, Instruction and Media
College of Education
Southern Illinois University
Carbondale, Illinois 62901

This article includes excerpts from: *The Microcomputer and the School Library Media Specialist.* Available, spring 1980 from: Libraries Unlimited, Inc., P.O. Box 263, Littleton, Colorado 80160

Copyright © 1979 Pierre P. Barrette All rights reserved.
Exclusive permission granted for
Reproduction and publication only to:
COMPUTE. The Journal for Progressive Computing™

American education is quietly undergoing an electronic revolution and microprocessor-based computers are the reason. In 1950 there were only seven macro (mainframe) computers in the United States. In 1976 there were over 90,000 macro and minicomputers. Of this number over 70,000 were minis. In 1979 over 400,000 macro, mini and microcomputers will have been sold Of this number over 250,000 are microcomputers! But what about 1987? A recently completed two year multimillion dollar study projects that in 1987 over 400 million intelligent electronic modules will be sold in the United States! This number reflects only the consumer market and not the industrial or business/communications sectors. No studies have yet been uncovered that project the number of microcomputers that will be sold to schools. But by 1987 it is safe to estimate that the K-12 school educational consumer market will reflect a conservative five percent of all consumer sales or approximately 2,000,000 units! If you add to this number the number of units sold to schools between 1979 and 1986 the figure goes over 4 million units or an average of 20 microcomputers of one type or another in every school in the United States.

What abouts costs? In 1968 a typical 16K computer cost about $68,000 excluding peripherals. In 1979 a 16K microcomputer system with keyboard, video display and cassette storage can be purchased off the shelf for about $850.00. It was further estimated that by 1987 the average selling price for intelligent electronic modules will be $50.00 using 1978 dollars, and this is only the beginning.

Are schools beginning to use microcomputers? A most definite yes. Actually schools don't use microcomputers, it's the teacher and students who do. Let's examine how educational microcomputer based application programs are developing and where the needs are. In general, application programs that have been and are being developed fall into two broad categories. One category is the direct instructional application designed for individual or small group use by students. The second category is the instructional management programs for use by teachers.

Direct microcomputer based instructional programs can be found in scattered but growing use across all grade levels and in almost all subject areas. These instructional programs can be further classified into five distinct categories. The first category is *Drill and Practice.* The second is *Simulation/Modeling.* The third is *Games.* The fourth is *Tutorial.* The fifth is a combination of the first four. Thousands of individual authors, both teachers and non-teachers are busily designing and developing direct instructional application programs. It should also be noted that a major textbook publisher has already developed and is marketing a microcomputer based instructional program series. This series uses minifloppies and employs color graphics and audio! The need for well designed and validated application programs that fit into the curricula of schools and match identified learning needs is enormous. Let's examine four categories of microcomputer-based instructional application programs a little more closely.

Drill and Practice. Programs of this nature are highly desirable to develop mastery skills associated with specific learning objectives. Essentially, items such as math, spelling, syntax, etc. are displayed for the student to practice a specific skill. The built-in random number generator function of a micro is a great help in mixing items. The student is expected to practice until mastery. Students, however, can quickly become tired or even frustrated with this type of program unless it is carefully designed.

Simulation/Modeling. Programs of this type are generally more complex to write. However, they are also highly desirable and are used by teachers to simulate or model real world events without having students physically encounter the actual forces that shaped the events. Decision making skills are developed. Extensive group discussion occurs. Often data is collected from real world environments and entered into the program. This type of program is often very economical and quite suited to be used with an individual or a group of students.

Games. These programs are fun. Students, as well as adults, spend hours with them. They serve a very important educational motivational purpose for many students. In addition, if the programs are well designed, they assist students in developing process thinking strategies.

Tutorials. These application programs are without doubt the most complicated to write. Their purpose is for students to acquire specific knowledge through well designed linear and branching frame sequences. Usually these programs are designed for individual student use.

It must be reemphasized that the need for well designed microcomputer based instructional application programs is enormous and will grow through the next decade. However, it must also be emphasized even more strongly that programs need to be personally validated

"How I Spent My Summer Vacation"

"My father brought home a computer. It was fun. The computer was like a teacher. I learned how to do graphs and lots of other things too. I had a really good time."

Sonja Richman – Age 9

Sonja used Program Design educational software on her TRS-80. PDI programs and games teach subjects like programming, reading, and grammar. Kids and adults like PDI because the programs keep them involved and entertained while they learn.

PDI has courses for all ages. Some of Sonja's favorite courses are **Graph Builder**, **Story Builder**, and **Memory Builder: Concentration**. For her parents, we have courses like **Step By Step** to teach them programming and **Spelling Builder**.

Guaranteed-to-load cassettes for APPLE, PET, TRS-80 Level II, ATARI

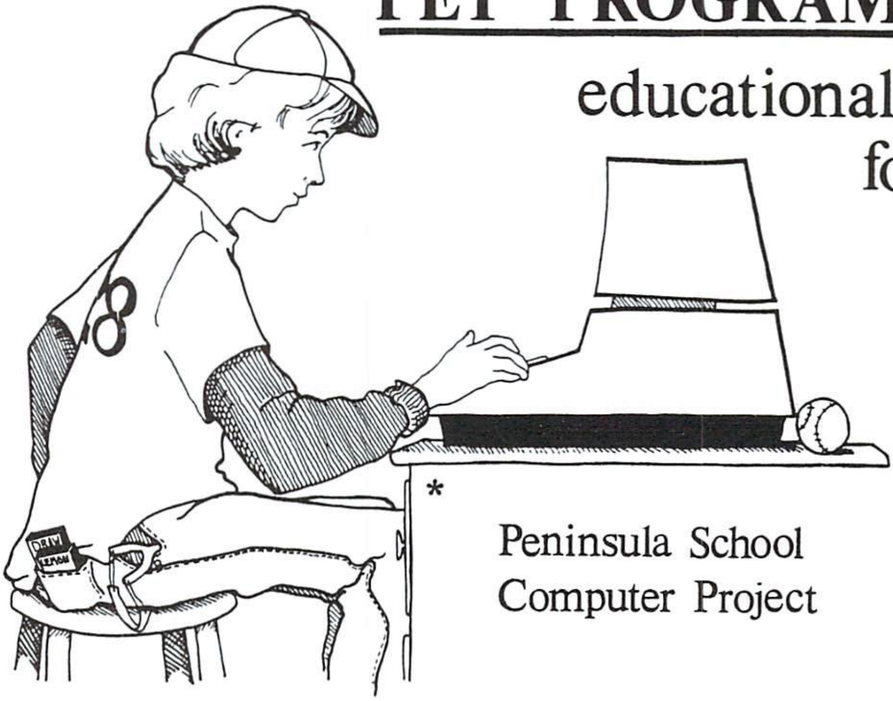
Send for our flyer. And see Program Design software at participating Computerlands and other fine computer stores.

PDI

Program Design, Inc., 11 Idar Court, Greenwich, CT 06830 (203) 661-8799

PET PROGRAM TAPES

educational software for 8k pets



Peninsula School
Computer Project

Our games and languages for 8K Pets are challenging and easy to use. **Draw** was featured in *People's Computers.* **Quest** will be featured in *Byte.* Each tape comes with a booklet of listings and other useful information. If any tape fails to load, return for a complete refund.

Tape #1: Pilot, Gold, Sky, Hammurabi, Names, Hands
Pilot is an easy-to-learn dialog programming language.
Five sample programs are included.

Tape #2: Renumber, Lemon, Kaleidoscope, WSFN
The **Lemon** player tries to maximize profits from a lemonade stand.
The **WSFN** programmer tells a "robot" to draw graphic designs.

Tape #3: Quest, Draw
Quest is a challenging cave exploration game.
Draw lets you paint pictures with the PET graphic characters.

- -

ORDER FORM

Tape #	**Price**	**Quantity**		**Total**
1	$19.95	x ___	=	$___.__
2	$14.95	x ___	=	$___.__
3	$ 9.95	x ___	=	$___.__
in Calif., add 6% sales tax				$___.__
	enclose			$___.__

Name ______________________________
Address ____________________________
____
City ________________ State _____ Zip ______

check payable to:

Peninsula Computer Project
Peninsula Way
Menlo Park, CA 94025

Retailers: Send for our wholesale order form.

Outside U.S.: add postage.

and must fit into established and emerging curricula of schools if they are to be accepted. Being able to write in the English language does not automatically qualify a person to be a teacher or an instructional designer. And, so it goes at being able to write programs in BASIC, Pascal, Tutor or PILOT, etc.

Thousands of individual authors from ages five through eighty- plus are busily designing and developing exciting and innovative instructional software programs around PET, APPLE II, ATARI, TRS-80, PROCESSOR SOL, TI 99/4 and other personal microcomputer systems. I can only encourage this activity while concurrently suggesting that efforts be shared with others including teachers, administrators and school board members. Remember to watch your language. By that I mean don't frighten others by impressing them with computer terminology. Save the RAM, ROM's, K's, DOS's and memory maps, etc. until the appropriate time. Otherwise, more harm than good may arise. Just remember where you were knowledge-wise a scant five years ago!

A second category of microcomputer based application programs falls into the instructional management area. While general ledger and small business application programs have been developed to operate on various microcomputer systems, few of these fit the day to day instructional management needs of teachers. Teachers need file management programs operating on disc based systems. They need programs to maintain student progress records. They need programs to analyze grades and programs to file learning objectives as well as test items. They need diagnostic programs. They need programs to match those media materials readily available in schools to specified learning objectives. They also need microcomputer based word processing text editing programs. These and other time savers will be in great demand in the near future. Other methods for data entry aside from keyboarding will be needed. One microcomputer systems supplier has just offered a new peripheral that uses common mark sense cards to read and load data directly into a microcomputer system. You can expect to begin seeing data entry methods employing voice recognition within five years!

While instructional and management applications of microcomputers in education continue to grow with self-contained application programs, the fetal horizon of a new most significant microcomputer application is just now presenting itself. This horizon deals with using microcomputers as intelligent terminals to access information data bases in the U.S. and throughout the world. Couple a microcomputer with a modem communications device and you have the capability to access huge machine readable data bases. Five years ago there were no more than 100 machine readable data bases. Today more than 1,000 exist and the number is growing weekly. Parents of children in elementary school perhaps need to realize that during the lifespan of their children ninety percent of all knowledge the world has ever known will be discovered! Access to this information via microprocessor based intelligent systems coupled to the expanding number of bibliographic and non-bibliographic data bases world wide may spell the difference in the future educational success of their children. A direct concerted effort by parents in encouraging microcomputer and intelligent terminal expenditures in schools, especially school library media centers, may realistically dictate the future viability of his or her child. The future is now.

Teachers as well as students will be accessing huge machine readable files from their school library media centers and from home. Already, in one state, for a nominal hook-up fee and a $2.75 per hour connect charge, an end user is provided a toll free number to a massive machine readable data bank. And this is only the beginning.

Suggestions to authors of microcomputer based instructional materials:

First of all, document, document and when you are tired of documenting, document some more. By this I mean not only be sure that you have entered liberal REMs, or other equivalent statements, within your application program but MORE IMPORTANT the following. As you test out (validate) versions of your program with your child or children it is even MORE IMPORTANT for you to keep a very careful log of how you gave and paid attention to the child. For example, how much time did you actually spend asking questions like ... What did you think or like about it??? In what ways did you positively reinforce the child for working at and perhaps achieving at a program that you may have designed? Were you persistent at encouragement? Test yourself with this question. How often and how much time have you spent talking about how your child is doing in a specific application program with your spouse, friends, or business associates? Do extra smiles, praise, or extra conversations develop at dinner? How about extra hugs! Only you can answer but if so it may give you this most important clue. Success in your application program may well not be a function of your adept programming skills, but the fact that you attended (paid attention) to what the child was doing. An enormous body of knowledge in the field of applied behavior analysis stands ready to back this most important point.

Pierre Barrette

A Call for Resources. My forthcoming book gives clear guidelines to school library media specialists and teachers on how to select and evaluate microcomputer based instructional materials. Authors hoping to market programs may want to closely examine these selection evaluation criteria guidelines.

A question often asked relates to the use of high level computer languages and the microcomputer. This certainly is a basic question. No pun intended! Many readers already know that BASIC is the most common high level language currently in use with microcomputers regardless of dialect. Most readers may also know that the BASIC language is not machine independent and consequently application programs are machine and often model specific. While a comparative discussion related to the educational implications of using

BASIC, Pascal, TUTOR, PILOT, COBOL, APL, FORTRAN, LISP and other high level languages would certainly bring out the advocates and create a host of new friends, it would almost as certainly polarize others. The book attempts to do neither. It does provide sample programs comparing both BASIC and Pascal.

It should be noted that a crosscompiler is in its final stages of design and will be able to download TUTOR developed programs into machine level to run on one of the microcomputers already available. This and other developments will be discussed.

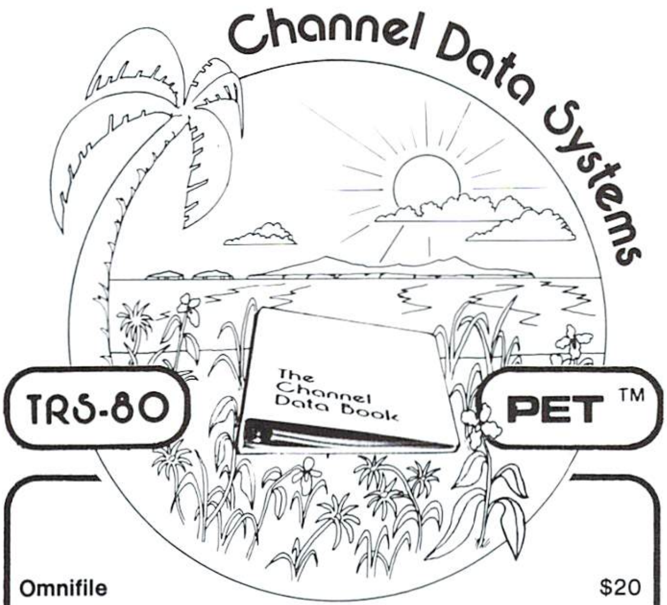
Sharing and exchanging ideas about resources is nothing new. People have networked their ideas formally and informally for years. Therefore, micronetworking in principle is not new but how to do it is quite another matter. Micronetworks are developing across the United States and overlap both public and private sectors including education. The book discusses how to establish a micronetwork if you're not already in one. It provides a bibliography of hundreds of micronetworks, many of whom exchange application programs at no charge.

Peripheral hardware is also a subject of interest. What's a daisy wheel, 5x7, 7x7, 7x9 and 1x9 dot matrix printer? What's a thermal impact or inkjet printer? These and other introductory questions about printers will be included in non-technical language. Also to be included is how data is stored on cassette, disc, bubble memories and videodiscs. The latest developments on interfacing microcomputers with videodisc playback machines will be discussed. In plain English the concepts of graphic resolution are presented together with differences between CRT and plasma display devices.

The preceding is only a thumbnail sketch of the contents of this new book. Other important professional educational issues are also raised such as the effect of state standards on purchasing microcomputers, data privacy, copyright and more. Throughout the book the enormously complex role of the school library media specialist is considered together with the impact of new communications and microprocessor technology. Extensive bibliographies are included. A separate bibliography of vendors and their services is included based upon a nationwide survey this past summer.

This author will be including a bibliography of instructional as well as management application reference sources in the book. If you have authored any programs and have actually used them with children or adults, write and let me know. Describe what it is you have done, who the programs have been used with and what microcomputer system you used. If you'd like your name included to share your programs or market them, let me know. Send a black and white glossy of your child or children using a microcomputer. I may be able to use the picture if you give me permission.

In the meantime, enjoy your microcomputer system. Learn as much as you can about it and share your enthusiasm with others. Comments relative to this article are most welcomed by the author. Write me.



Omnifile $20
A powerful database program with sorting, formating, and computational features for accessing and processing almost any type of record. Suitable for mailing lists, checkbook and other transaction records, inventories, sales records, statistical records and even as a cash register.

Personal Ledger $20
A complete double entry bookkeeping system with provisions for budgeting and keeping records of income, expenses, assets and liabilities. Provisions for entering transactions, adding or editing accounts, and printing of a detailed Income Statement and Balance Sheet.

Data Logger $10
User can save and easily find any data item in a list e.g., address lists, mini-inventories, etc. Designed in a generalized framework to allow the user to adapt the program to individual applications.

All **Channelgram** software includes a complete manual with instructions, listing, & sample data.

The Channel Data Book for Pet $20
A complete hardware and software updated reference service listing descriptions for over 1400 software programs and over 200 peripheral devices for PET. Designed to organize documentation, newsletters, listings, and other user selected information in an attractive 3-ring binder.

Cash, Checks, Money Orders, Visa, Master Charge
805 964-6695
5960 Mandarin Ave. Goleta CA 93017

EDUCATORS TAKE NOTE!!

2 computers NOW = 3* computers

(*at least through November 30, 1979.)

PET
PERSONAL ELECTRONIC TRANSACTOR
commodore
PET
2001 Series
personal computer

Commodore & NEECO have made it easier and less expensive to integrate small computers into your particular school system's educational and learning process. The Commodore Pet has now proven itself as one of the most important educational learning aids of the 1970's. Title IV approved!

8K Pet $\$795$
16K Pet (Full keyboard) $\$995$
32K Pet (Full keyboard) $\$1295$

New England Electronics Company is pleased to announce a special promotion in conjunction with Commodore Itn'l Corporation. Through November 30th, 1979, educational institutions can purchase two Commodore Pet Computers & receive A THIRD PET COMPUTER ABSOLUTELY FREE!!

The basic 8K Pet has a television screen, an alpha-numeric and extensive graphics character keyboard, and a self-contained cassette recorder which serves as a program-loading and data storing device. You can extend the capability of the system with hard copy printers, floppy disk drives & additional memory. The Pet is a perfect computer for educational use. It is inexpensive, yet has the power & versatility of advanced computer technology. It is completely portable & totally integrated in one unit. NEECO has placed over 100 Commodore Pets "in school systems across the country." Many programs have been established for use in an educational environment, they include:

• NEECO Tutorial System	$\$29^{95}$
• Projectile Motion Analysis	$\$19^{95}$
• Momentum & Energy	$\$19^{95}$
• Pulley System Analysis	$\$19^{95}$
• Lenses & Mirrors	$\$19^{95}$
• Naming Compound Drill	$\$19^{95}$
• Statistics Package	$\$29^{95}$
• Basic Math Package	$\$29^{95}$
• Chemistry with a Computer	$\$15^{00}$

NEECO
679 Highland Ave.
Needham, MA 02194
(617) 449-1760

DON'T DELAY! TIME IS LIMITED!
CALL OR WRITE FOR ADDITIONAL INFORMATION TODAY!

Flying With PET PILOT: Kids And Microcomputers At Peninsula School

Katie A. Thornburg and David D. Thornburg
Peninsula School Computer Project
Peninsula School, Peninsula Way,
Menlo Park, CA 94025

Peninsula School is a privately owned and operated parent-teacher cooperative which provides an alternative to public elementary education in the San Francisco Bay area. Microcomputers were introduced at Peninsula School during the fall of 1977 in response to parent interest in preparing their children to experience the ever-increasing utility of computers in modern society. The process of developing computer literacy in the Peninsula community has been a multi-faceted one. It has involved acquainting both faculty and students with computer capabilities and designing suitable programs to promote the use of the computer as a creative tool. Funding of the project has been accomplished by parent donations and the sale of programs written and donated to the school by parent computer professionals. After school computer classes have supplemented the limited classroom availability of the computers.

The initial exposure of students and faculty to the games authored by the parent volunteers came through computer open houses and a very brief series of classes. This introduction was sufficient to generate considerable student enthusiasm and to allow the teachers to assess the appropriateness of computer based materials for individual classroom situations. Due to the limited nature of available resources (both volunteers' time and the number of microcomputers - 2 PETs - then at the school's disposal), educational efforts were subsequently focused on the upper grades.

The initial program library provided by the volunteers consisted of:

- **DRAW,** a program that allows even young children to make pictures using the PET's graphic characters
- the programming language **PET PILOT**
- adaptions of 5 programs to **PET PILOT:**
  - **GOLD,** a version of Goldilocks in which the user helps the computer write the story
  - **SKY,** a question and answer game whose questions depend in part on the user's answers.
  - **NAMES,** which explores ideas the user has about his or her name
  - **HANDS,** which suggests new ways of looking at everyday things
  - **HAMMURABI,** a simulation in which the user makes economic decisions that mean life and death in the small country he or she rules
- **LEMON,** a simulation of running a lemonade stand
- **QUEST,** a challenging cave exploration game
- **WSFN,** a programming language that can be used to teach elementary concepts of computer programming and spatial representation by having the user give instructions to a make-believe "turtle" on the display screen.

NAMES and **HANDS** were originally written to encourage students with writing blocks to express themselves verbally by engaging them in a dialogue. Among the additions to these programs the **MAD LIB** was another creative writing stimulus which has proven to be quite popular. In this type of program, the user is asked to supply examples of several parts of speech which are then inserted by the computer into the appropriate blank spaces of a pre-programmed story often provided by another user.

During the course of the school year students progressed from playing games to writing programs. As they became comfortable with the mechanics of interacting with the computer, students began to identify loopholes in games such as **LEMON.** Both the sense of mastery obtained from locating these loopholes and the humorous potential offered by creative writing exercises such as **GOLD** and **MAD LIB** provided an impetus for students to learn programming.

Of the languages available to us (**PILOT, BASIC, WSFN**), **PET PILOT** was selected as the jumping-off point for introducing students and teachers to programming. **PILOT** is a computer language for dealing with words (in the sense of character strings) rather than for performing computations. However, it should be noted that the Peninsula School **PILOT** interpreter is written in **BASIC** rather than in machine language; **BASIC** commands for numerical manipulations can be readily incorporated into **PILOT** programming using our interpreter. The examples of **PILOT** games provided by the volunteers were developed to serve as models for teachers to modify in generating material more relevant to their own classroom needs.

As it was our primary intent to enable students and teachers to become comfortable with microcomputing, we chose a computer language that would minimize the mechanical hang-ups of communicating with the computer, thereby minimizing programmer frustration in achieving his or her goal. **PILOT** satisfies this objective in that its commands are simple and it performs important formatting functions automatically. The end result - the appearance of a story or story-like game on the computer display - therefore does not become subordinated to the intricacies of the computer language in which it is programmed.

PILOT (Programmed Inquiry, Learning or Teaching) was invented by John A. Starkweather at the University of California Medical Center in San Francisco to simplify the writing of programs that mainly consist of conversational dialogs. It is a language that can be readily understood by most eight year olds. In our version of **PILOT** most statements have the form:

```
command: text
```

or

```
command condition: text
```

Our set of ten commands and two conditions allows compact representations of very sophisticated programs to be made.

The commands most commonly found in student programs are **T:**, **A:** and **M:**; often in conjunction with the conditionals **Y** and **N** (for yes and no).

```
T: WHAT IS YOUR NAME?
```

will cause the words **WHAT IS YOUR NAME?** to be displayed on the computer screen.

```
A: ANSWER$
```

will capture a user response and place this result in the string variable **ANSWER$.**

```
M: HORSE, COW, ELEPHANT
```

will compare the result of the most recent **A:** statement with the words HORSE, COW, or ELEPHANT. As a result of using an **M:** statement, the value of the conditionals **Y** and **N** is set. If any of the words HORSE, COW, or ELEPHANT is contained anywhere in the response to the previous **A:** statement, **Y** is true. **Y** and **N** are mutually exclusive. Selective use of command statements occurs when the conditional appears alongside the command. In a **PET PILOT** program in which the statement pair

```
TY: THAT IS A GOOD ANSWER!
TN: PLEASE TRY THAT AGAIN.
```

appears, **THAT IS A GOOD ANSWER!** will be printed if and only if **Y** is true. **PLEASE TRY THAT AGAIN.** will be printed if and only if **N** is true.

In comparing **PILOT** with **BASIC, T:** is often compared with **PRINT,** and **A:** with **INPUT.** As implemented on the PET, there are important differences in these operations. These differences generally result in shorter, more readable programs in **PILOT.** If a long string of words in **BASIC** is displayed using **PRINT,** it is possible to have words fracture at the end of a line and finish on the next line. When **T:** is used in **PILOT,** the interpreter verifies that a word completely fits on a line before that word is displayed on the screen. If the word does not fit, the word is automatically printed on the next line. The major difference between **A:** and **INPUT** involves character shifting. When character strings are entered, **A:** automatically shifts the characters so that the keyboard behaves as a normal typewriter. (*i.e.*, unshifted letters appear in lower case and shifted characters appear in upper case.). This overcomes the character shifting problem found in the 8K PET's.

For most of our beginning programmers, **T:** and **A:** statements have been adequate to allow stories and dialogues to appear on the computer screen. However, we can better illustrate the greater simplicity and legibility of language arts programs written in **PILOT** with a teacher-authored version of IN and OUT, a program involving the **M:** command to test for the "INNESS" or "OUTNESS" of various words. After being presented with numerous examples of words which are either "IN" or "OUT," the user is asked to identify the criterion of "INNESS" or "OUTNESS"; in this case words beginning with vowels turn out to be "IN," and those beginning with consonants are therefore "OUT."

As written in **PET PILOT,** the relevant criterion defining portion of the program appears as

```
A: AN$
M: bA,bE,bI,bO,bU,
TY: AN$ IS IN,
TN: AN$ IS OUT.
```

As written in **BASIC,** the equivalent function appears as

```
1000 T$ = “AEIOU”
1100 F = O
1200 INPUT AN$
1300 FOR I = 1 TO 5
1400 IF LEFT$(AN$,1) = MID$(T$I,1)
THEN F = 1
1500 NEXT I
1600 IF F = 1 THEN PRINT AN$;“bIS
IN.”
1700 IF F = O THEN PRINT AN$;“bIS
OUT.”
```

(In the above two program segments, **b** indicates a typed space.) If the matching had been performed against a list of words rather than against single letters, the **BASIC** program would have grown much more complex. The **PILOT** program, however, would have remained about the same in length.

Just as playing computer games has generated an interest in programming, student curiosity about computers has bred student enthusiasm for every aspect of microcomputing. Older children (at least 9 years of age) branched out into **BASIC** and **WSFN.** Unlike many apprehensive adults first encountering microcomputers, our students have approached the machines eagerly and have emerged from the program with confidence in their abilities to interact with computers. Concommitantly, students have been seen to have an increased confidence in themselves that has carried over into other areas of their lives.

The computers have been a vehicle for bringing children together. Each computer has often been used by two or three children working jointly on a program or game. This sharing of resources has been extended beyond the solving of common problems to peer teaching. Children who have acquired a mastery over some aspect of microcomputing readily and voluntarily share their knowledge with newcomers, thus imparting a tremendous sense of cohesiveness to the entire computer activity.

Classroom time allotted to computer instruction both during and after school has proven insufficient to meet student demand for access to the machines. Students and faculty have obtained permission to take the computers home overnight and on weekends to share with their families. At a recent workshop held at the school, children were able to spend an entire day learning about computers with their parents and friends. On viewing her children's involvement in the computer project, one parent remarked, "It's great!"

Acknowledgement: We wish to thank Dotty Calabrese, Anne Branch, Dave Offen and Phyllis Cole for their contributions to this article. We also wish to acknowledge the tremendous energy, effort and enthusiasm expended by Larry Tesler, Phyllis Cole, Dave Offen, Roger Chaffee, Bob Albrecht and Ramon Zamora in making this project a reality.

Review

Petunia & Petunia Player

$29.95 & $14.95

HUH Electronics
1429 Maple Street
San Mateo, CA 94402

PETUNIA is a 4-voice music system which delivers "Chamberlin type" (see "BYTE" SEPTEMBER, 1977) music through your amplifier-speaker system. The PETUNIA board plugs into your parallel user port and your 2nd cassette interface. A minimal amount of coding and documentation is provided with the PETUNIA which (unless you want to do a lot of work from scratch) is why you will want to also purchase the PETUNIA PLAYER.

The PETUNIA PLAYER is a program on cassette which plays several sample songs and also allows you to code in music of your own. The coding required to enter your own music is simple enough, but tedious.

The sound generated is full and rich — very organ-like in timbre — you will want to play it through a hi-fi system rather than the small speaker-amplifiers many of us have been using with the CB2 sound.

The music I found easiest to code in and the most satisfying to play is music arranged for choral groups e.g. (S.A.T.B. or T.T.B.B.). These seem to fit the four voices of the PETUNIA best.

I found it very simple to add another jack and two wires to the board so that I can implement the CB2 (Pet Gazette conventions) sound without removing the PETUNIA board each time.

If you are interested in computer music and don't mind the translating from sheet music, the PETUNIA & PETUNIA PLAYER combination may be for you.

by Dr. Matarella

IRIDIS™

Programs for your **ATARI**®

- **IRIDIS** is a monthly cassette magazine of programs for the **ATARI 400** and **800** personal computer.
- You get four excellent programs each month on a high quality C-30 cassette, ready to load and run.
- Each issue of **IRIDIS** has an animated "Front Cover" that will delight your eyes!
- With each cassette you get **IRIDIS Notes**, a lively newsletter of information about the **ATARI** computer. You may disagree with our opinionated editors, but you'll never be bored!
- **IRIDIS** brings you fun and games, education, and business programs and "software tools" that will help you enjoy your **ATARI**.

☐ 12 issues for $39.95 in US & Canada
☐ 4 issues for $14.95
☐ Sample copy $4.95

We Accept VISA and Mastercharge

Name ____________________
Address ____________________
City ____________________
State/Zip ____________________

IRIDIS, Box 550, Goleta, CA 93017

Teachers, Computers And The Classroom

By C.J. Carr and Everett Q. Carr

The self-contained general purpose microcomputers are standing at the classroom door. Whether the computer will become a part of every classroom's equipment may be determined within the next couple of years. The principle judges will be the army of classroom teachers, and they are tough judges.

So far the personal microcomputers have been in the hands of enthusiasts willing to invest many hundreds of hours of their lives testing the computer reliability, improvising curriculum, writing programs for students and teachers, searching literature for program materials, comparing texts, testing tapes and cassettes; engaged in all the tasks that distinguish a leader in any field. To these people, the David Ahls, the Larry Tesslers, Lud Brauns and Peninsula School Projects, the rest of the schools already owe much.

Our work with computers began in 1977 with the construction of an IMSAI 8080 from a kit that included 16K of memory and a North Star minifloppy diskette. This computer, destined for computer control in a planetarium, was an excellent learning tool for learning machine language and BASIC programming, in addition to the base provided in computer jargon. The IMSAI however, is not the kind of machine you would want to live with in the classroom. Its weight, size and dangling ribbon cables make it unwieldy and vulnerable.

The announcement of the PET was an occasion of great interest. Commodore promised a self-contained, instant-on, built-in video, cassette permanent storage memory, 8 Kilobyte RAM Memory and an 8K Microsoft BASIC in ROM in production quantities at a startlingly low price.

Software Specialists Science and Education

Microphys Programs

Dear Educator:

Microphys is pleased to introduce its series of computer programs which have been specifically designed for use on the Commodore PET microcomputer. These programs have readily enabled instructors to provide their students with an opportunity to review, in an interesting and effective manner, the important concepts encountered in introductory courses in chemistry, physics, mathematics, and English vocabulary.

The advent of microprocessor technology has virtually revolutionized the concept of computer utilization within the academic environment. No longer need a teacher consider being merely a part of a large time-sharing network in which cost factors, response times, available storage etc. serve to limit, if not completely discourage, the use of the computer in the classroom.

The PET microcomputer is relatively inexpensive, yet it possesses the power and versatility generally associated with standard mini-systems. It is completely portable and its silent operation permits its use during lecture and recitation classes. Students may create and store their own programs on standard audio cassettes which they purchase and retain.

Please note that the vast array of software programs, which have been **uniquely** designed for use on the PET microcomputer, will readily enable you to use the microsystem in your courses as soon as it arrives. The programs are available on cassette tapes and arrive complete with full instructions for their immediate use even by those who have little, if any, experience with the use of the computer itself.

There are three types of programs in the Microphys series:

I. **Computer-Assisted Instruction Programs** guide the student through a series of quantitative questions; the student interacts with the computer and receives immediate evaluation of his responses and/or assistance when needed. Each time a particular program is run, a different set of numerical data is generated. In most instances, an entirely new problem is presented.

II. **Individualized-Instruction Programs** generate a unique set of problems for each student. The essential information needed to solve each problem is recorded and, when he is ready to do so, the student may obtain the computer's answers and compare his results. These answers may be suppressed by deleting line number 8500 in any program. When now run, a unique set of problems is produced for each student who records the essential information along with his code number which is generated by the computer. When his work is completed, the student enters his code number and answers into the program which had given him his assignment. The computer will then grade his work, displaying the answers to those problems which were incorrectly solved; a percent score and a brief comment reflecting an overall evaluation are also given.

III. **Utility Programs** are designed to provide solutions to time consuming problems often given on exams or homework assignments. Problems in calorimetry, stoichiometry, projective motion, vector analysis, etc. require tedious computation. These utility programs free teachers from the time required to obtain the correct solutions. Students may also be permitted access to these programs in order to check their own work.

Please note that each physics and chemistry program has both the computer-assisted instruction and individualized instruction versions recorded on opposite sides of the cassette. The vocabulary programs are similarly designed; the computer assistance being rendered by providing the student with a sentence in which the word to be defined is used properly. With this contextual clue, the student is again asked to correctly select the proper definition. The math cassettes have only an individualized-instruction mode.

Chemistry and Physics Cassettes

1. Linear Kinematics
2. Projectile Motion*
3. Momentum and Energy*
4. Energy and the Inclined Plane
5. Inelastic Collisions
6. Centripetal Force
7. Pulley Systems — Machines*
8. Specific Heat Capacity
9. Calorimetry
10. Heats of Fusion/Vaporization
11. Specific Gas Laws
12. General Gas Law
13. Thermodynamics I
14. Thermodynamics II
15. Transverse Standing Waves
16. Longitudinal Standing Waves
17. Lenses and Mirrors*
18. Refraction of Light
19. Series Circuit Analysis
20. Parallel Circuit Analysis I
20A. Parallel Circuit Analysis II
21. Series/Parallel Circuit Analysis*
22. Faraday's Law
23. Gram-Molecular Mass
24. The Mole Concept*
25. The Molarity Concept*
26. The Normality Concept
27. The Molality Concept
28. Stoichiometry: Mass/Mass
29. Stoichiometry: Mass/Volume
30. Stoichiometry: General*
32. Percent Concentration
33. pH Concept
34. EMF of Electrochemical Cells
35. Electric Field Analysis
36. Photoelectric Effect
37. Symbols and Valence Drill
38. Formulas of Compounds Drill*
40. Total Internal Reflection

Vocabulary Cassettes

401. 12th Grade I
402. 12th Grade II
403. 12th Grade III
404. 12th Grade IV
405. 12th Grade V

406. 11th Grade I
407. 11th Grade II
408. 11th Grade III
409. 11th Grade IV
410. 11th Grade V

411. 10th Grade I
412. 10th Grade II
413. 10th Grade III
414. 10th Grade IV
415. 10th Grade V

416. 9th Grade I
417. 9th Grade II
418. 9th Grade III
419. 9th Grade IV
420. 9th Grade V

421. 8th Grade I
422. 8th Grade II
423. 8th Grade III
424. 8th Grade IV
425. 8th Grade V

426. 7th Grade I
427. 7th Grade II
428. 7th Grade III
429. 7th Grade IV
430. 7th Grade V

Note: Please indicate whether you desire the 8K or 16K version of a given program when placing an order.

The cost of each cassette is $20.

Math Cassettes Senior High School

701. Quadratic Equations
702. Trigonometry I
703. Simultaneous Equations (2x2)
704. Simultaneous Equations (3x3)
705. Geometrical Areas
706. Trigonometry II
707. Verbal Problems I — Numbers
708. Verbal Problems II — Coins
709. Verbal Problems III — Ages
710. Verbal Problems IV — Interest
711. Verbal Problems V — Mixtures
712. Verbal Problems VI — Geometry
713. Verbal Problems VII — Rates
714. Verbal Problems VIII — Digits
715. Verbal Problems IX — Work
716. Arithmetic Progressions I
717. Arithmetic Progressions II
718. Geometric Progressions I
719. Geometric Progressions II
720. Types of Variation
721. Linear Equations
722. Formula Evaluation
723. Coordinate Geometry I
724. Exponents and Logarithms
725. Verbal Problems — General

Math Cassettes Junior High School

801. Magic Squares
802. Multiplication
803. Division
804. Modular Arithmetic
805. Proportion Problems
806. Percent Problems
807. Addition of Fractions
808. Subtraction of Fractions
809. Multiplication of Fractions
810. Division of Fractions
811. Mode, Median, and Mean
812. Bar Graph Analysis
813. Decimals I
814. Decimals II
815. Verbal Problems I

Utility Cassettes

301. Vector Analysis I
302. Vector Analysis II
303. Gas Law Analysis
304. Optics Analysis
305. Projectile Analysis
306. Calorimetry Analysis
307. Chemistry I Analysis
308. Chemistry II Analysis
309. Stoichiometry Analysis

Microphys Programs

2048 Ford Street
Brooklyn, New York 11229
(212) 646-0140

By the spring of 1978, with delivery time down to 3 months, and after we had spent nearly 10 hours on a PET at a cooperative Computer Shop 50 miles away, we ordered our own personal PET and recommended the machine for a trial program in our schools. Our PET arrived in July 1978 and it seemed that we sat down to learn about programming it on July 4th, and didn't get up till August. By September, we were able to fill the 8K RAM of the PET with interactive programs in weather forecasting, a simulation of the first flight to Mars for our Gifted/Talented Child programs and an electronic flip-chart for presentations about computers for schools.

Our planetarium's Gifted/Talented Child program for 4th, 5th and 6th graders was our first opportunity to teach programming from our own material called "BASIC in 8 Wonderful Hours." By this time we had literally spent a year of our lives mastering computer fundamentals and were ready for the kids and teachers. In addition, a proposal written in December 1977 was approved for a small grant that allowed purchasing two school PETs to lend to schools during the 1978-79 school year. An informal survey had shown that over 60% of the area's high school math teachers had already taken a course in computer programming as an elective. Most had some knowledge of FORTRAN. It was with this group we started early in 1978 with a mini-micro-computer show from an area computer shop.

Each teacher who was to receive a computer for classroom use was required to spend two full school days with the PET computer, receiving individual one-on-one tutoring. They were supplied with an 8 hour BASIC programming course, CAI tapes in BASIC programming and 20 blank C10 cassettes. Nine of thirteen area schools joined this lending program and supplemented the grant to cover software costs. Each school had the PET for a month's trial. In all, this lending program was an amazing success. We tutored 18 teachers who in turn supplied a measure of computer literacy to about 600 high school seniors during 20 school days at each school. Our 20 Gifted/Talented children at 4th, 5th and 6th grades had a short course of about 12 hours sharing 4 computers and using CAI tapes. They flew to Mars, explored its surface and returned to Earth with Martian soil samples in a planetarium/computer simulation.

The enthusiastic response of teachers, students and administrators, and the timely offer of Commodore in offering 3 PETs for the price of 2, permits our area to start the 1979-80 school year with 53 PET computers and 10 of 13 schools participating.

Another small grant, written in December 1978 and approved for July 1979, allowed us to offer an intensive 40 hour two-week course for Gifted/Talented 7th, 8th and 9th graders. In this intensive course, 20 students each had access to one of 20 computers for the entire period. There were always 4 tutors on the computer floor for the most intensive type of individual tutoring. This "Computer Survival Course for Kids" was considered completely successful. Not a single child missed a single minute of the 40 hours. 17 of 20 kids took a computer home for a week.

There are several key problems to solve in achieving our local goal that every school section and building will have a classroom full of computers by 1985.

The problems are:

1. Teacher preparation/acceptance
2. Curricula development/matching software
3. The rate of technological development
4. Funding

While I can justify a limited number of hours of computer games, only a fully prepared teacher with the correct software is equipped to prevent abuse of the computer's potential. And only if teachers are prepared and confident will they accept a computer in the classroom as anything other than an interesting short-term diversion.

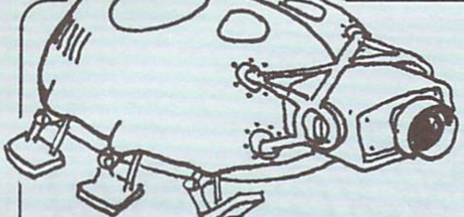
The key element is an acceptable computer curriculum. There are first commercial attempts at this with math programs for Kindergarten to 8th grade on 6 type C10 cassettes. While I am sure many of these sets will be purchased, there is a chance that the backlash of the reaction to poor material could have long-term adverse effects. High quality CAI material and drill materials are required. Suppliers should be aware that a high quality program which costs $300 is far more acceptable than $30 programs that are inadequate in performance.

The rate of technological progress is an unknown factor. Consider, for example, the effects on schools comparing a choice of features like:

a. Color high resolution, color graphics and built-in disc memories
b. High resolution graphs, illustrations and animation
c. Talking computers, equipped with variations of a 5 cm diameter video disc containing a basic and special English vocabulary, which can be called with a computer routine which responds in less than 10 milliseconds
d. The declining cost of land communications by fiber optics or satellite/home video antenna receivers that allow home communication with a central US data bank through your own computer
e. The improved all-digital disc which will be cheaper and more reliable than any other storage media and yet allow easy access for a personal computer.

Funding computer equipment costs present fewer problems than one may imagine. There always seems to be a fund to cover hardware. The cost of updating teachers is another matter. Few universities or colleges are in a position to obtain microcomputers quickly, nor do they have instructors with the background to do the teacher teaching. There are interesting times ahead.

A Christmas Buyer's Guide
AND A VISIBLE MEMORY, AND A PETDAC, AND A MICROTEA, AND...
Commodore PET
BLAIR



Have You Been Bitten By The Computer Bug?

creative computing
creative computing

Basic Computer Games

Edited by David Ahl, this book contains 101 imaginative and challenging games for one, two, or more players — Basketball, Craps, Gomoko, Blackjack, Even Wins, Super Star Trek, Bombs Away, Horserace. Simulate lunar landings. Play the stock market. Write poetry. Draw pictures.

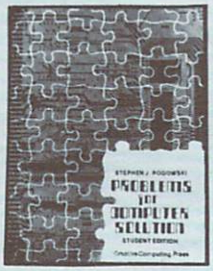
All programs are complete with listing in Microsoft Basic, sample run and description. Basic conversion table included. 125,000 copies in print. 192 pages softbound. [6C] $7.50.

BASIC COMPUTER GAMES
MORE BASIC COMPUTER GAMES

More Basic Computer Games

Contains 84 fascinating and entertaining games for solo and group play — evade a man-eating rabbit, crack a safe, tame a wild horse, become a millionaire, race your Ferrari, joust with a knight, trek across the desert on your camel, navigate in deep space.

All games come complete with program listing in Microsoft Basic, sample run and description. 192 pages softbound. [6C2] $7.50.



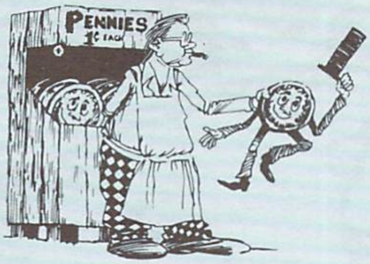
Problems for Computer Solution

Problems for Computer Solution by Stephen J. Rogowski is an excellent source of exercises in research and problem solving for students and self-learners. Problems like the Faulty Speedometer Spotter make learning fun and easy. 104 pages, softbound, [9Z] $4.95.

creative computing
creative computing

The Best of Creative Computing

The first two years of **Creative Computing** magazine have been edited into two big blockbuster books. **American Vocational Journal** said of Volume 1, "This book is the 'Whole Earth Catalog' of computers." [6A] Volume 2 continues in the same tradition. "Non-technical in approach, its pages are filled with information, articles, games and activities. Fun layout." —**American Libraries.** [6B] Each volume $8.95.



Computer Coin Games

Computer Coin Games by Joe Weisbecker aids newcomers to the field of computers by simplifying the concepts of computer circuitry through games which can be played with a few pennies and full sized playing boards in the book. Enhanced by outrageous cartoons, teachers, students and self-learners of all ages will enjoy this 96 page softbound book. [10R] $3.95.

Creative Computing Magazine

Creative Computing has long been Number 1 in applications and software for micros, minis, and time-sharing systems for homes, schools and small businesses. Loads of applications every issue: text editing, graphics, communications, artificial intelligence, simulations, data base and file systems, music synthesis, analog control. Complete programs with sample runs. Programming techniques: sort algorithms, file structures, shuffling, etc. Coverage of electronic and video games and other related consumer electronics products, too.

Just getting started? Then turn to our technology tutorials, learning activities, short programs, and problem solving pages. No-nonsense book reviews, too. Even some fiction and foolishness.

Subscriptions: 1 year $15, 3 years $40. Foreign, add $9/year surface postage, $26/year air. Order and payment to: Creative Computing, Attn: Karen, P.O. Box 789-M, Morristown, NJ 07960. Visa or MasterCharge acceptable by mail or phone; call **800-631-8112** 9 am to 5 pm EST (in NJ call 201-540-0445).

How To Order If Your Dealer Is Out Of Stock

Creative Computing Software should be stocked by your local retail computer store. If your favorite outlet does not have the software you need, have him call our retail marketing dept. at **800-631-8112.** (In NJ, 201-540-0445).

Or you can order directly from Creative Computing. Send your check for tapes plus $1.00 shipping and handling per order to Creative Computing Software, P.O. Box 789-M, Morristown, NJ 07960. NJ residents add 5% sales tax. Visa, MasterCharge or American Express are also acceptable. For faster service, call in your bank card order toll free to

800-631-8112

(In NJ, call 201-540-0445)

More Games, Challenging Problems And Programs Than You Can Shake A Joystick At!

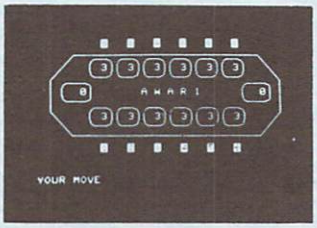
Send 3 stamps for our two big 20-page catalogs of software, books and T-Shirts.

PET

$ 7.95

Logic Games-1, CS-1001 (8K)

How logical are you? Test your strategy and logical abilities against the computer or another player in these fun and challenging games.



1. Awari

Awari is an ancient African game played with beans on a board divided into pits: six per player on the sides and two home pits at each end of the board. Test your strategy against PET's by moving more beans into your home pit. On each move, you take the beans from any pit on your side and "sow" them, one in each pit going counterclockwise. Additional rules make the game more interesting. The program has a learning mechanism which makes it progressively harder to beat. Uses graphics.

2. Bagels

Bagels anyone? Try to guess the computer's secret three-digit number. The computer will respond to your guess with the clues pico, fermi, or bagels, to indicate which digits are correct and which are in the right place.

3. Chomp

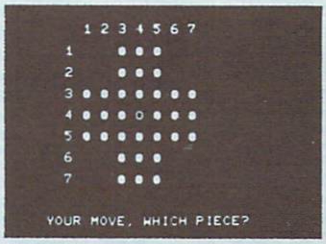
Hungry? Well, have a cookie, but don't bite the poisoned corner! Two or more players take turns chomping on a cookie (actually a grid up to 9x9). The loser is the player forced to chomp the poisoned corner. A challenging game of strategy.

4. Flip-Flop

The object of Flip-Flop is change a row of ten X's to a row of 0's in a minimum number of moves. On each move you may flip any of the ten positions, but the catch is that flipping one letter may cause several others to flip too.

5. Hexpawn

Hexpawn is played with chess pawns on a 3x3 board. The pawns are moved as in chess. The object of the game is to get one of your pawns to the opposite side of the board or to prevent your opponent from moving. Hexpawn is a learning game-the computer begins with random moves and learns how to play, gradually becoming an excellent player.



6. Hi-Q

In this version of the Old European solitare game of logic with jumping pegs. You try to leave one peg in the center hole. A tough challenge.

$ 7.95

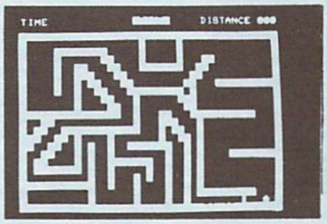
Action Games, CS-1008 (8K)

1. Splat

This game simulates a parachute jump. The object is to open your chute at the last possible moment without going SPLAT! You can jump on any planet, even the sun, or set your own terminal velocity, acceleration, and freefall time. After setting the timer, the PET displays the descent of the parachutist. "...they picked him up and poured him from his boots."

2. Car Race

Come to the PET 500! Drive a car around the racetrack at your own speed, and see if you qualify for the Grand Prix!



3. Breakout

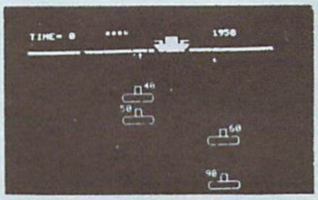
Here's a dynamic version of Breakout for your PET. Try to knock all the bricks off the wall for a maximum number of points. The position of the paddle is controlled by the keyboard.

4. Bowling

Welcome to the PET Bowling Lanes! Up to 4 players can compete for the highest score. You can throw hooks as well as straight balls in this game. But stay out of the gutter!

5. Tank

A thrilling action game that everyone will enjoy! Every game has a new layout with walls, trees, and lakes. Maneuver your tank around the obstacles and try to blow up your opponent's tank. Tank has screen wrap around and ricocheting projectiles. This action game is one of the staff's favorites.



6. Subs

You are in control of a ship and drop depth charges to sink the subs and score points, while the subs launch missiles at you. Subs carry different point values depending on their depth. Extensive game options allow you to set many parameters—speed, frequency of enemy missiles, etc. Subs is another of the staff's favorites.

$ 7.95

Sensational Simulations, CS-1201 (8K)

1. Animal

In this game, you teach the computer. You think of an animal and the computer tries to guess what it is. If the computer guesses incorrectly it will ask for a yes-no question that differentiates the animal you were thinking of from the one it guessed. In this way the computer 'learns' new animals. And just what does distinguish a leopard from an ocelot?

2. Fur Trader

You are the leader of a French fur trading expedition in 1776 leaving the Ontario area to sell furs and get supplies for the next year. You can choose the fort at which you wish to trade and the type of furs you wish to trade. To get the best prices for your furs, you must take your chances with the Iroquois Indians, the Lachine Rapids, and other hazards.

3. Hammurabi

Test your administrative abilities by governing ancient Sumeria for a 10-year term in office (if you last that long). Each year you must make decisions of how much to feed your people, and what land to cultivate and trade with neighboring city-states. Hazards include a bad harvest and rats that eat the grain in storage.

4. Stock Market

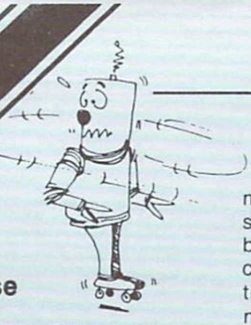
Try your luck in the stock market and make your fortune! You start with $10,000 and may buy or sell stocks with a 1% brokerage fee on each transaction. The computer controls the mini-economy and the stock exchange.

5. Word

How rich is your vocabulary? Match your wits against the computer by trying to guess the computer's mystery word. After each guess, clues are provided which indicate how many of the letters in your guess are in the mystery word and if any are in the correct position.

Use the handy postcard to order CREATIVE COMPUTING Software.

PET

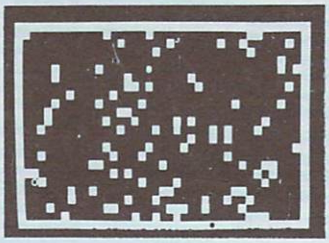


Graphics Games-1, CS-1004 (8K)

$ 7.95

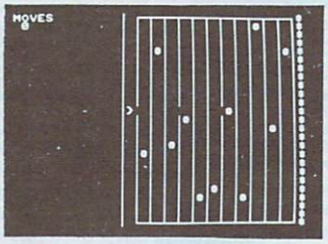
1. Chase

Chase is a fast-paced two-player game. One player pursues the other through a maze of obstacles and "zap doors" which instantly transport the marker to another place on the screen. The players alternate between chasing and being chased, and play for the best time. Each player controls his marker with a set of nine directional keys.



2. Escape

Try to escape from a maximum-security prison patrolled by robot guards who destroy anyone they encounter. You must time your forward and backward movements precisely to move through the doors which open and close periodically, while at the same time avoiding the guards. The robot guards can tell when you're nearby and take action to intercept you.



```
MOVES
0
```

3. Dart

Here's a game in which you must estimate the answer to an arithmetic problem as quickly as possible. Choose the type of problem and the skill level. The accuracy of your estimates are shown graphically on a dartboard. For one or two players.

4. Snoopy

Curse you Red Baron! Try to shoot down the Red Baron before he gets you by correctly computing positive and negative distances on a number line. There are five timed skill levels ranging from Cadet to Ace. Which one are you?

5. Sweep

Hit nine targets in the correct order by controlling the path of a rollerball which increases in speed. Be careful—if you go too near a wrong target you will be deflected away and lose points.

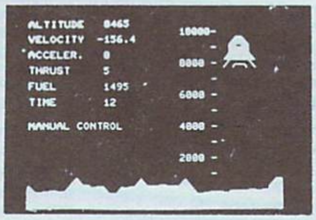
Graphics Games-2, CS-1005 (8K)

$ 7.95

This exciting set of games lets you wipe out your opponent with radioactive material or a cannon, land on the moon, or test your strategy against the PET.

1. LEM

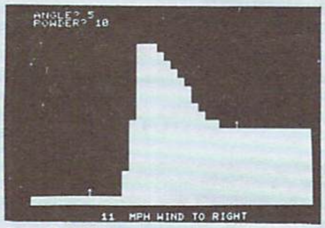
In this graphic real time lunar landing game, you must land on the moon's surface with the lowest possible velocity. You can control the thrust of your retro-rockets with the number keys but have only a limited amount of fuel. The automatic pilot option can be activated and deactivated with the keyboard. You take a walk on the moon and plant a flag if you land successfully.



```
ALTITUDE    8465       10000-
VELOCITY   -156.4          -
ACCELER.    0          8000 -
THRUST      5              -
FUEL        1495       6000 -
TIME        12             -
                       
MANUAL CONTROL         4000 -
                           -
                       2000 -
                           -
```

2. Nuclear

Nuclear is an exciting strategy game for two players. Each player, in turn, places a particle of radioactive material on a 6x6 board. When the number of particles at a location reaches its critical mass, it explodes sending particles to adjacent squares. As the board fills up, a single explosion can cause long chain reactions. The object of the game is to cause the right chain reaction to wipe out all of your opponent's pieces. Nuclear is a game of skill, fast decisions, and quick reversals, providing fun for many hours.



```
ANGLE? 5
POWDER? 10

11  MPH WIND TO RIGHT
```

3. Artillery

In the game of Artillery, two players shoot cannons at each other over computer-generated terrain. You choose the firing angle and the number of bags of powder to be used, and then observe the trajectory of the shot on the screen. Artillery makes good use of PET's graphics, changing the terrain and wind speed for each game.

4. Bounce

Bounce is an intriguing graphics demonstration which traces the path of a ball as it bounces around the screen.

5. Checkers

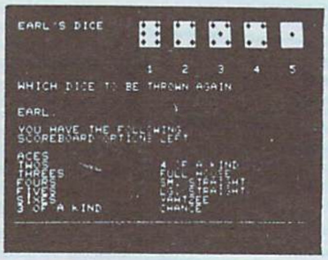
PET matches strategy against you in this popular game. The computer does not look ahead more than one move ahead, hence the game is best suited for beginning players.

6. Dodgem

Dodgem is played on a checker type board against the computer or another player. The object of the game is to block your opponent to slow him down. One player moves pieces from the bottom of the board to the top, and the other player moves from left to right trying to get all the pieces off the board. This is a challenging strategy game.

Board Games, CS-1007 (8K)

$ 7.95



```
EARL'S DICE

                  1    2    3    4    5
WHICH DICE TO BE THROWN AGAIN

EARL.

YOU HAVE THE FOLLOWING
SCOREBOARD OPTIONS LEFT

ACES
TWOS                  4 OF A KIND
THREES                FULL HOUSE
FOURS                 SM. STRAIGHT
FIVES                 LG. STRAIGHT
SIXES                 YAHTZEE
3 OF A KIND           CHANCE
```

1. Yahtzee

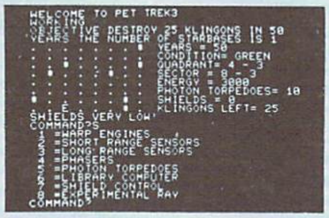
In this is PET version of the popular dice game of Yahtzee, the PET rolls the dice, gives you your options and keeps score for up to four players.

2. Blackjack

Come to the PET Casino! Up to four players can try their playing skill and luck against the PET dealer in this game of Blackjack.

3. Backgammon

Test your backgammon strategy against the PET's. The computer varies its strategy both within and between games and plays an excellent game! It even doubles if it is winning. This version of Backgammon makes impressive use of PET graphics.



```
WELCOME TO PET TREK3
WORKING
OBJECTIVE DESTROY 25 KLINGONS IN 50
YEARS THE NUMBER OF STARBASES IS 1
                              YEARS = 50
                              CONDITION= GREEN
                              QUADRANT= 4 - 3
                              SECTOR = 8 - 3
                              ENERGY = 3000
                              PHOTON TORPEDOES= 10
                              SHIELDS = 0
      E                       KLINGONS LEFT= 25
SHIELDS VERY LOW'
COMMAND?S
 1 =WARP ENGINES
 2 =SHORT RANGE SENSORS
 3 =LONG RANGE SENSORS
 4 =PHASERS
 5 =PHOTON TORPEDOES
 6 =LIBRARY COMPUTER
 7 =SHIELD CONTROL
 8 =EXPERIMENTAL RAY
COMMAND?
```

4. Trek3

Trek3 is our PET version of the popular Startrek game. You, as captain of the Enterprise, must destroy the Klingons who threaten the Federation. This real time version gives you control over phasers, torpedoes, warp drive, and a "computer" function to help out in tight situations. This is a real classic that should be in everyone's software library.

5. One Check

One Check is an intriguing game of strategy. You start with two rows of checkers on the outside spaces of all four sides of the board. The object of the game is to remove as many checkers as possible by diagonal jumps. Almost chess-like in nature, moves must be planned well ahead so you do not leave isolated pieces. It is very challenging (almost impossible!) to clean off the board, but it can be done!

Use the handy postcard to order CREATIVE COMPUTING Software.

$ 7.95

Number Games-2, CS-1002 (8K)

The Number Games tape contains an exciting family of "guess the number" games. Pit your skill against the PET in these six games.

1. Guess

Guess is the simplest of the number guessing games. The computer selects a number between 1 and any limit you set. You then guess the number using the clues "too high" or "too low" provided by the computer.

2. Letter

Letter is an alphabetic version of the game of Guess. It's not as simple as it sounds.

3. Number

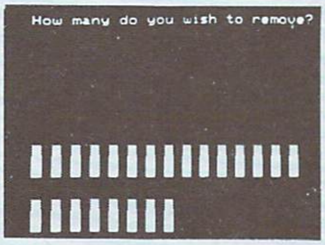
This game is different in that you only get one guess per round. The computer-selected number is between 1 and 5, and you gain or lose points depending on how close your guess is. If you guess the number exactly, you hit the jackpot and double your point count.

4. Trap

The computer selects a random number between 1 and 100, and you must guess the number by trapping it between your two numbers. The computer tells you if the mystery number is higher, lower, or between your trap numbers.

5. Stars

You try to guess a mystery number between 1 and 100. But this time the computer tells you if you're getting closer or farther away, but not the direction to go. It requires a different playing strategy.



```
How many do you wish to remove?
```

6. 23-Matches

You start with 23 matches. You and the computer alternate taking matches away from the pile. On each turn you may take 1, 2, or 3 matches. The player forced to take the last match loses. Uses graphics.

$ 7.95

Conversational Games-1, CS-1006 (8K)

1. Eliza

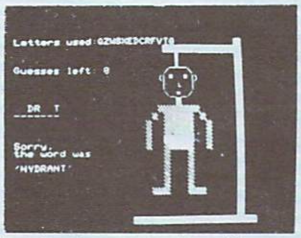
Eliza is the PET version of the famous conversational program written by Dr. Joseph Weizenbaum. In it, the computer plays the role of a psychoanalyst, responding to your statements. Eliza works by analyzing your input, searching for certain key words and phrases, and preparing the appropriate reply. Amaze your non-computer friends with intelligent babbling!

2. Hurkle

In five moves or less, you try to find the Hurkle who is hiding on a 10x10 grid. He gives you clues like "Go Northwest" or "Go South". This game is useful for teaching children how to use Cartesian plane coordinates, or just to play for fun.

3. Hangman

Hangman is the PET version of the popular word game. The secret word may be selected by a friend or the computer. The graphics makes the game fun as well as educational. Try these words with your Scrabble champion: vizsla, snitch, mnemonic, or frankly.



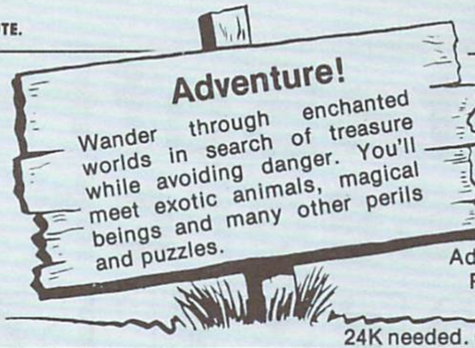
```
Letters used:GZWSXEDCRFVTG

Guesses left: 8

 DR  T
-------

Sorry,
the word was
'HYDRANT'
```

4. Hexletter

Hexletter is an intriguing strategy game played on a hexagonally-shaped board. The object is to capture more letters than your opponent, which can be the computer or a friend.

5. Haiku

You and the PET compose Haiku poetry. The computer has a library of stored phrases and puts them together in sometimes funny, sometimes meaningful ways.



Adventure!

Wander through enchanted worlds in search of treasure while avoiding danger. You'll meet exotic animals, magical beings and many other perils and puzzles.

Adventureland and Pirate Adventure on one tape.

24K needed. CS-1009. $14.95.

$ 7.95

Logic Games-2, CS-1003 (8K)

Here are six fascinating and challenging games of logic to test your skill and strategy.

1. Rotate

A 4x4 board is filled with the letters A through P in random locations. Your task is to put them in alphabetical order in as few moves as possible by rotating groups of four letters counterclockwise. Sound easy? Try it!

2. Strike-9

In Strike-9, you begin with a list of numbers 1 through 9. On each roll of the dice, you must remove digits from the list adding up to the roll. The game ends if you can't do it. The object is to remove all nine numbers.

3. Nim

Nim is one of the oldest two-person games known to man. Here you play against the PET. You can specify the number of piles of beans, the size of each pile, and the win option of either taking or not taking the last bean. Uses graphics.

4. Even-Wins

Challenge the computer! A random odd number of beans are placed in a resource pile. On each turn players take from 1 to 4 beans from the pile. When there are no more beans in the resource pile, the player with the even number of beans wins. The computer does not like to lose.

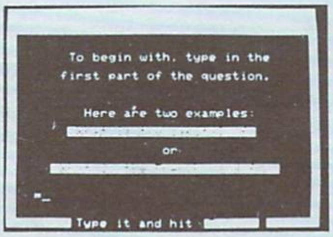
5. Not One

The game of Not One is played with two players (you and a friend or the computer) and a pair of dice. Players roll the dice and get points for the number rolled. You can continue rolling as long as you wish, but if any roll is the same as your first, your score for that round is 0. Win by having the highest score at the end of ten rounds.

6. Batnum

Batnum (Battle of Numbers) is a completely generalized game involving taking beans from a pile. You determine the size of the resource pile, the minimum and maximum beans per turn, the win option, and who goes first. Uses graphics.

Study Made Easy, CS-1202 (8K)



```
To begin with, type in the
first part of the question.

Here are two examples:

or

Type it and hit
```

Study Made Easy is a quick and easy way to study. You decide which subjects you wish to study. You decided how fast you want to work and when you've done enough. The PET becomes your assistant, aiding in the entry of questions and answers.

Study Made Easy will create study drill tapes automatically. You can use this program to study chemical symbols, U.S. presidents, or any other subject which can be studied by drill and practice. The computer creates a tape that you can place in the PET and use immediately. You don't need to know anything about computers to use Study Made Easy.

Study Made Easy comes with three prepared drills and the program needed to make new study drills packaged in an attractive cassette binder. The programs are interactive, self-instructing and easy to use.

Or send payment plus $1.00 shipping to Creative Computing, Box 789-M, Morristown, NJ 07960.

DataSoft Research

PRESENTS....

ASK FOR YOUR FREE BROCHURE TODAY!

a Pet* software production

Your PET* needs us!

NEW

PROGRAM™ GENERATOR

PAD™ Program Aided Display

NEW

SOFTFILE™

PREVIEWS

PAD™	PROGRAM GENERATOR	SOFTFILE
Over a dozen functions to aid you in designing your output display! ■ Reduce programming time! ■ Create geometric shapes ■ Pattern designs ■ Graph & Chart displays ■ Gameboards (eg checkerboards) ■ Label & Title displays ■ Draw (horizontal, vertical, & diagonal lines) ■ Erase ■ SAVE DISPLAY (for future use!) ■ and more...	TOP SECRET	LOADING
ADMISSION $19.50	ADMISSION $14.50	ADMISSION $14.50

See these NEW releases on a PET* near you!

DataSoft
Research
the company that makes
programming a little easier

PG | Pet Guidance suggested

3360 LEY DRIVE SUITE #816
LOS ANGELES, CALIFORNIA 90027

*PET is a Trademark of Commodore

- Dealer Inquiries Invited -

PRINTED IN U.S.A

HOW TO EXPAND THE PET*

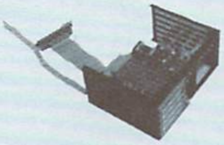
A. TAKE ONE PET COMPUTER (presently support "old 8K" with "new PETS" supported by Nov. 1979)

K-1007A-1 PET TO MTU INTERFACE $99
- New redesigned - cable may be unplugged to move the system
- Accepts 1 MTU expansion board or plugs into the K-1005-P card file
- Hardware & Software video switch for either PET video or MTU graphics
- Graphic screen image position controls

B. ADD ONE MTU PET EXPANSION INTERFACE

C. DECIDE IF YOU WANT ONLY ONE MTU EXPANSION BOARD OR MORE (JUMP TO STEP E IF ONE)

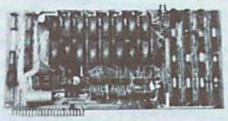
K-1005-P EXPANSION CARD FILE $80
- Black anodized aluminum frame chassis with plastic card guides for 5 boards
- Double sided backplane with five connectors and shielded bus lines
- An application backplane is available for custom wiring



D. ADD FIVE BOARD EXPANSION CARD FILE

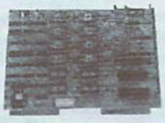
E. SELECT EXPANSION BOARD(S) NEEDED (NOW OR FUTURE)

1. K-1008A-P VISIBLE MEMORY



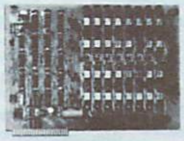
K-1008A-P VISIBLE MEMORY $243
- 320 wide by 200 high bit map graphics
- Each point individually addressable
- Machine language graphic/text software called from PET BASIC-K-1008-3C $20
- 8K byte RAM doubles the standard 8K PET memory size
- Drives the PET CRT monitor through the K-1007-A interface and/or use a CCTV monitor

2. K-1012A SYSTEM EXPANSION BOARD



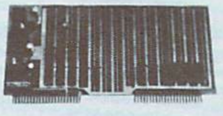
K-1012A SYSTEM EXPANSION BOARD $295
- 12 PROM sockets (2708/TMS2716) - for 12 PROMS, it uses the power of one!
- 32 bidirectional I/O lines
- Full RS-232 asynchronous serial communications - 75-4800 baud
- PROM programmer

3. K-1016A 16K MEMORY BOARD



K-1016A 16K MEMORY BOARD $340
- 16K byte memory, addressed as contiguous 16K starting at any 4K boundary
- Super low power - MAX 1.6 WATTS total

4. K-1020A PROTOTYPE BOARD



K-1020A PROTOTYPE BOARD $42
- On board regulators for +5V @ 1.2A and +12V @ 0.50A
- Manual provided to allow documenting your circuit. Also gives instructional guide to design on the MTU/KIM bus
- Universal 0.100 inch pattern on 1/3 of board allows 8, 14, 16, 20, 22, 24, 28, 40, 64 pin ICs
- Bus and application edge fingers provided

5. K-1013A FLOP — oops, to be announced

6. K-1008A-4 SUPERRES — oops, to be announced

7. K-1002A-8 8 VOIC — oops, to be announced

If you know our other products, you know how good these will be!

K-1002-2A 8 BIT DAC MUSIC BOARD $50
- 8 bit digital to analog converter with ± ¼ LSB linearity
- Sharp low pass filter designed for 8.7KHz sample rate
- Hi Fidelity power amplifier - 400 mW RMS into 4 ohm - with volume control
- Plugs into I/O and second cassette port regenerating the edge fingers for reuse
- Software for 4 voices, up to 16 harmonics in waveform

F. TO ADD MUSIC, TRUE MULTI-HARMONIC (UP TO 16) WAVEFORMS AND 4 VOICES SIMULTANEOUSLY, SELECT K-1002-2A

G. ORDER REQUIRED MATERIALS FROM MTU

All MTU products are supplied with full documentation manuals which have been classed as "best in the industry". All manuals for hardware may be purchased seperately.

All hardware products are tested and burned in at the factory. A full 6 month guarantee comes with each hardware product, with service support by the factory.

CALL OR WRITE FOR OUR NEW OCTOBER FULL LINE CATALOG AND TO BE ADDED TO OUR MAILING LIST

MICRO TECHNOLOGY UNLIMITED

a DIV. of Consilidated Sciences Inc.
841 Galaxy Way
P.O. Box 4596
Manchester, N.H. 03108
(603)627-1464

* PET is a registered trademark of Commodore

apple® computer

Apple II Reference Manual	$10.00
Apple Soft Manual	10.00
Programmer's Guide (Computer Station)	5.95
Apple II Monitor Peeled	9.95
Software Directory for Apple	
• Business, Finance & Utility	4.95
• Games, Demo, Utility	4.95
Best of Contact '78	2.50
Programming in PASCAL (Grogono)	9.90

INTERFACE CARDS	
Prototyping/Hobby Card	$ 24.00
Parallel Printer Interface Card	180.00
Communications Card & DB25 Connector Cable	225.00
High-Speed Serial Interface Card	195.00
Language System with Pascal (48K RAM & Disk II Required)	495.00
Applesoft II Firmware Card	200.00
16 Input Analog Card	295.00

ACCESSORIES	
Disk II—Drive Only	495.00
Disk II—Drive & Controller (32K Min. RAM Recommended)	595.00
Vinyl Carrying Case	30.00
Tape Recorder	40.00
Programmers Aid No. 1 Firmware (For Use with Integer BASIC)	50.00
Clock/Calendar Card	199.00
Auto—Start ROM Package (For Apple II Only)	65.00
Digikitizer Pad by Talos (Kitform)	499.00

High Resolution Light Pen	199.00
Micromodem (D.C. Hayes)	379.00
12" B/W Leebex Monitor	149.00
Cable from Monitor to Apple II	9.95
13" Color TV Compatible with Apple II	290.00
Sup-R-Modulator (RF)	25.00

SOFTWARE FOR APPLE II	
PASCAL from Programma	49.95
FORTH	49.95
LISP—from Apple Software Bk No. 3	N/C
LISA—Interactive disk assembler	34.95
WHATSIT—Excellent conversational data base manager	32K 100.00 48K 125.00
SARGON-Champ of 2nd West Coast Computer Faire	19.95
APPLE PIE—Excellent text editor	24.95
FORTE—Music editor in hires	19.95
FASTGAMMON—Excellent backgammon game with graphics	Tape 20.00 Disk 25.00
APPLE 21—Excellent blackjack game	9.95
BRIDGE CHALLENGER—Computer bridge	14.95

FINANCIAL MANAGEMENT SYSTEM

- Accounts Payable
- Accounts Receivable
- Inventory Control
- $200 Each Package
- Ledger Processing
- Payroll
- $800 Complete
- $10 for Manual

PRINTER SPECIALS FOR APPLE AND PET	
TRENDCOM 100 with interface for Apple or PET	450.00

LITE PEN used with TV or monitor screen	34.95
ALF Music Synthesizer Boards	265.00
Supertalker	279.00
Anadex DP-8000 with tracter 8" paper width and interface to Apple	1050.00
Centronics 779-2 for Apple II with parallel interface	1245.00

SOFTWARE (Send for complete Software Catalog $1.00)	
Dow Jones Portfolio Evaluator/Stock Quote Reporter Disk	50.00
Microchess 2.0 Chess Disk	25.00
Disk Utility Pack with DOS 3.2	25.00
The Controller (General Business System)	625.00
Apple Post (Mailing List System)	49.95
Bowling Program Diskette-	15.00
The Cashier (Retail Store Management	250.00
Checkbook Cassette	20.00
Applesoft II Language & Demo Cassette	20.00
RAM Test Tape with Manual	7.50
Finance 1-2 Cassette Package	25.00
Datamover/Telepong Cassette (Com. Card & Modem Req'd)	7.50
Microchess 2.0 Chess Tape	20.00
Bowling Program Tape	15.00
Pascal with Language System (48K RAM & Disk II Required)	495.00

New for Apple Computer Owners at Low ComputerWorld Prices

8" Disk Drives with housing **$1295.00** for single drive **$1895.00** for dual drive

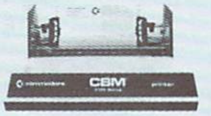
apple computer

Joystick for Apple II **Only $39.95 each.**
ComputerWorld's Complete Library of 600 Apple II programs **Only $60.00**

A PROFESSIONAL BUSINESS SYSTEM

commodore CBM™

2001-8	$795	CBM 2023 Printer	$849
2001-16N	$995	IEEE to IEEE Cable	$49.95
2001-32N	$1295		
2001-32B	$1295		
External Cassette	$95		
PET to IEEE Cable	$39.95		



CMB 2022
$995

CBM 2040
$1295

2001-16B
$995

PET™

Commodore PET Service Kit	$30.00
Beeper—Tells when tape is Loaded	24.95
Petunia—Play music with PET	29.95
Video Buffer—Attach another display	29.95
Combo—Petunia and Video Buffer	49.95

SOFTWARE FOR PET			
Mirrors and Lenses	19.95	Checkers and Baccarat	7.95
The States	14.95	Chess	19.95
Real Estate 1 & 2	59.95	Series and Parallel Circuit Analysis	19.95
Momentum and Energy	19.95	Home Accounting	9.95
Projectile Motion	19.95	BASIC Math	29.95
Mortgage	14.95	Game Playing with BASIC Vol. I, II, III	9.95 each
Dow Jones	7.95		
Petunia Player Sftwr	14.95		

Join Now

Become a member of ComputerWorld's RAYGAMCO Computer Discount Club.

By being a RAYGAMCO Member you receive substantial discounts on every item you purchase, including all hardware, software, accessories, even books and paper! You will also receive a monthly newsletter with all the latest available for your particular computer system, and much, much more — exclusive to RAYGAMCO Members only!

Here's how to join.

Nothing to buy. Simply complete the self-addressed postcard in this magazine with name, address, and your computer system. You'll receive your personalized RAYGAMCO Computer Discount Club Membership Card in the mail with information on how to use your card when ordering for big savings!

Charter RAYGAMCO Members' Special. Join now and receive 20% OFF of any purchase.*

*20% offer expires December 24, 1979. Offer is valid for RAYGAMCO Members only.

ComputerWorld

A RAYGAM COMPANY

6791 Westminster Ave., Westminster, CA 92683 (714) 891-2587

PDi

TURN YOUR COMPUTER INTO A TEACHING MACHINE

Program Design has educational and game programs for the whole family – from preschool child to adults. Programs are simple to use, fun, and most important . . . they teach!

READING COMPREHENSION: WHAT'S DIFFERENT? Ages 8 up PET $14.95
10 reading comprehension programs which present logical problems where the student picks the one word in four which doesn't belong with the rest. Builds analytical skills essential for understanding what you read.

PRESCHOOL IQ BUILDER Ages 3–6 PET, APPLE II, TRS–80 LEVEL I or LEVEL II $13.50
Teaches vital cognitive skills that children must learn in order to do well in school. In Part 1, Same and Different, the child discriminates between two forms. In Part 2, Letter Builder, the child matches a letter on the TV monitor to one on the keyboard. Accompanying Parent's Guide gives instruction.

STEP BY STEP Ages junior high to adult PET, APPLE II, TRS–80 LEVEL I, LEVEL II
32 programs and a 64-page workbook teach programming in BASIC for the beginner. Introduces all important BASIC commands and programming logic, including simple string logic and one-dimensional arrays. Lessons are interactive, presented in a question-and-answer format on the computer screen. The Workbook adds extra information. Through instruction, structured practice, and frequent skills testing, the user learns how to write BASIC programs.
3 tapes, Workbook, vinyl binder $39.95 on 2 APPLE DISKS $49.95

MEMORY BUILDER: CONCENTRATION Ages 6 up PET, APPLE II, TRS–80 LEVEL II $13.50
A series of educational games to improve memory, attention span and concentration. Letters and 3-letter words are used. Player has three options: play against the computer, play against him or herself, play against another player. Especially good for parent and child to play together.

STORY BUILDER/WORD MASTER Ages 9 up PET, APPLE II, TRS–80 LEVEL II $13.50
Series of partially completed verses that the child completes. Teaches grammar skills in an enjoyable way. Word Master is a logic game where the child tries to guess a 3-letter word generated by the computer. Teaches reasoning and vocabulary.

CODE BREAKER Ages 10 to adult PET, APPLE II $13.50
3 scrambled message games of increasing difficulty that build basic word handling skills needed for good writing. First game scrambles letters within the words in the message; next 2 games scramble letters and also word order. The last game gives the hardest messages. Messages are made up by the computer from an extensive word list.

MORSE CODE GAME All ages PET $16.50
Turns the PET into a Morse Code sender. Practice receiving code at different speeds, store messages in code, or play against another player. Includes plug for 2nd cassette port; user supplies inexpensive 6-volt DC buzzer.

Program Design, Inc. 11 Idar Court Greenwich, Conn. 06830 203-661-8799

Skyles Electric Works

You love your PET, but you'll love it more with this BigKeyboard?

74KB Big KeyBoards @ $125.00 (Plus $5.00 shipping & handling)

The Skyles Big KeyBoard™. More than 15 inches wide. A layout nearly identical to the PET Keyboard and with *all* functions—alpha, numeric, graphics, special symbols, lower case alpha—on full-sized, almost plump, key-tops double-shot to guarantee lifetime durability.

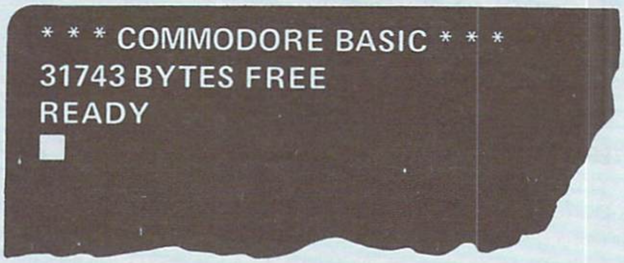
Actual size

Would you like to turn on your PET . . . and see this

8KB 8K Memory Expansion Systems @ $250.00 (Plus $3.50 shipping & handling)

16KB 16K Memory Expansion Systems @ $450.00 (Plus $5.00 shipping & handling)

24KB 24K Memory Expansion Systems @ $650.00 (Plus $5.00 shipping & handling)



```
* * * COMMODORE BASIC * * *
31743 BYTES FREE
READY
■
```

Skyles Memory Expansion Systems are complete; nothing more to buy. • First quality static RAMs • Solid soldered on first quality glass epoxy board • Separate PET Adapter Printed Circuit Board connects directly to data bus on your PET—no rat's nest of hanging hand-wiring • Ribbon cable and 50 pin connectors that keep your PET open to the outside world (one on the 8KB; *two* on the 16KB and 24KB).

____ **8KB Memory Expansion System(s)** at $250 each. $______
(Adds 8,192 bytes; total 15,359)(*shipping and handling $3.50 each*)

____ **16KB Memory Expansion System(s)** at $450 each. $______
(Adds 16,384 bytes; total 23,551) (*shipping and handling $5.00 each*)

____ **24KB Memory Expansion System(s)** at $650 each. $______
(Adds 14,576 bytes; total 31,743) (*shipping and handling $7.00 each*)

____ **74KB Big KeyBoard(s)** at $125 $______
(*shipping and handling $5.00 each*)

____ **SPECIAL DEAL(S):** 8KB Memory and 74KB KeyBoard at $350 complete $______

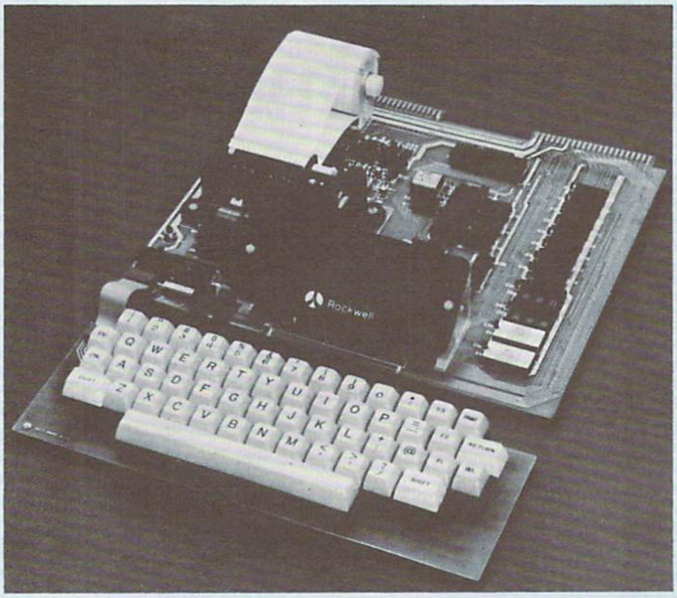
____ **SPECIAL DEAL(S):** 16KB Memory and 74KB KeyBoard at $525 complete $______

* Please add 6% sales tax if you are a California resident; 6.5% if a resident of BART, Santa Clara or Santa Cruz Counties (CA). Please add shipping and handling costs as indicated.

VISA, MASTERCHARGE ORDERS CALL (800) 227-8398 (except California residents)
CALIFORNIA ORDERS PLEASE CALL (415) 494-1210

Skyles Electric Works
10301 Stonydale Drive
Cupertino, CA 95014
(408) 735-7891

AIM 65 BY ROCKWELL INTERNATIONAL



AIM 65 is fully assembled, tested and warranted. With the addition of a low cost, readily available power supply, it's ready to start working for you.

AIM 65 features on-board thermal printer and alphanumeric display, and a terminal-style keyboard. It has an addressing capability up to 65K bytes, and comes with a user-dedicated 1K or 4K RAM. Two installed 4K ROMS hold a powerful Advanced Interface Monitor program, and three spare sockets are included to expand on-board ROM or PROM up to 20K bytes.

An Application Connector provides for attaching a TTY and one or two audio cassette recorders, and gives external access to the user-dedicated general purpose I/O lines.

Also included as standard are a comprehensive AIM 65 User's Manual, a handy pocket reference card, an R6500 Hardware Manual, an R6500 Programming Manual and an AIM 65 schematic.

AIM 65 is packaged on two compact modules. The circuit module is 12 inches wide and 10 inches long, the keyboard module is 12 inches wide and 4 inches long. They are connected by a detachable cable.

THERMAL PRINTER

Most desired feature on low-cost microcomputer systems . . .

- Wide 20-column printout
- Versatile 5 x 7 dot matrix format
- Complete 64-character ASCII alphanumeric format
- Fast 120 lines per minute
- Quite thermal operation
- Proven reliability

FULL-SIZE ALPHANUMERIC KEYBOARD

Provides compatibility with system terminals . . .

- Standard 54 key, terminal-style layout
- 26 alphabetic characters
- 10 numeric characters
- 22 special characters
- 9 control functions
- 3 user-defined functions

TRUE ALPHANUMERIC DISPLAY

Provides legible and lengthy display . . .

- 20 characters wide
- 16-segment characters
- High contrast monolithic characters
- Complete 64-character ASCII alphanumeric format

PROVEN R6500 MICROCOMPUTER SYSTEM DEVICES

Reliable, high performance NMOS technology . . .

- R6502 Central Processing Unit (CPU), operating at 1 MHz. Has 65K address capability, 13 addressing modes and true index capability. Simple but powerful 56 instructions.
- Read/Write Memory, using R2114 Static RAM devices. Available in 1K byte and 4K byte versions.
- 8K Monitor Program Memory, using R2332 Static ROM devices. Has sockets to accept additional 2332 ROM or 2532 PROM devices, to expand on-board Program memory up to 20K bytes.
- R6532 RAM-Input/Output-Timer (RIOT) combination device. Multipurpose circuit for AIM 65 Monitor functions.
- Two R6522 Versatile Interface Adapter (VIA) devices, which support AIM 65 and user functions. Each VIA has two parallel and one serial 8-bit, bidirectional I/O ports, two 2-bit peripheral handshake control lines and two fully-programmable 16-bit interval timer/event counters.

BUILT-IN EXPANSION CAPABILITY

- 44-Pin Application Connector for peripheral add-ons
- 44-Pin Expansion Connector has full system bus
- Both connectors are KIM-1 compatible

TTY AND AUDIO CASSETTE INTERFACES

Standard interface to low-cost peripherals . . .

- 20 ma. current loop TTY interface
- Interface for two audio cassette recorders
- Two audio cassette formats: ASCII KIM-1 compatible and binary, blocked file assembler compatible

ROM RESIDENT ADVANCED INTERACTIVE MONITOR

Advanced features found only on larger systems . . .

- Monitor-generated prompts
- Single keystroke commands
- Address independent data entry
- Debug aids
- Error messages
- Option and user interface linkage

ADVANCED INTERACTIVE MONITOR COMMANDS

- Major Function Entry
- Instruction Entry and Disassembly
- Display/Alter Registers and Memory
- Manipulate Breakpoints
- Control Instruction/Trace
- Control Peripheral Devices
- Call User-Defined Functions
- Comprehensive Text Editor

LOW COST PLUG-IN OPTIONS

• A65-010—4K Assembler—symbolic, two-pass	**$79.00**
• A65-020—8K BASIC Interpreter	**99.00**
• 3K RAM Expansion Kit	**50.00**

POWER SUPPLY SPECIFICATIONS

- +5 VDC ± 5% regulated @ 2.0 amps (max)
- +24 VDC ± 15% unregulated @ 2.5 amps (peak) 0.5 amps average

PRICE: $369.00 (1K RAM)

Plus $4.00 UPS (shipped in U.S. must give ***street*** address), $10 parcel post to APO's, FPO's, Alaska, Hawaii. All international customers write for ordering information.

We manufacture a complete line of high quality expansion boards. Use reader service card to be added to our mailing list, or U.S. residents send $1.00 (International send $3.00 U.S.) for airmail delivery of our complete catalog.

RNB ENTERPRISES
INCORPORATED

2967 W. Fairmount Avenue
Phoenix AZ. 85017
(602)265-7564

master charge VISA

Software Specialists Science and Education

Microphys Programs

September 1, 1979

Dear Educator:

Microphys is pleased to announce the release of two utility programs which have been designed to permit instructors in **every academic area** to establish an unlimited number of source files in which questions used on exams and homework assignments may be conveniently stored. These questions may then be accessed by students as a means of review and may also serve as the basis for individualized exams and homework or study assignments.

QUESLO enables the instructor to readily create source files. The text of each question, the possible choices, and the correct answers are merely typed into the computer and stored on the disk file designated by the instructor. Additional questions may be added to a given source file at any time.

QUEGEN can access any source file and generate an individualized exam or assignment for each student using a subset or the entire group of questions previously entered. **QUEGEN** will provide the correct answers so that the student may assess his performance.

If the instructor wishes to do so, the answers may be suppressed by deleting line #8500 from **QUEGEN.** This will prevent the computer from displaying the answers to a student's exam or assignment. Each student will be given a randomly selected **code number** and a unique assignment which he may complete away from the computer.

When the student has completed his work, his results may be graded by running **QUEGEN** from line #9000. The computer will then request that the student enter his answers and assignment code. The computer will then grade the assignment, displaying the correct answers to those questions which were missed by the student. A percent score is indicated and a brief comment, reflecting an overall evaluation, is also given.

QUESLO and **QUEGEN** have been designed for exclusive use on the Commodore 16K PET microcomputer. The 2040 dual drive floppy disk peripheral is also required. The two programs are accompanied by complete instructions and sell as a set for $40. Source files containing questions in virtually every academic discipline will soon be made available.

If you need additional information or wish to place an order, please write to the above address.

Respectfully yours,
Allen I. Rosen

***DISKETTES** — For Use With Commodore's 2040 Drive

P1 — **Physics I Disk** — contains the following 14 programs: 1,2,3, 2, 3, 4, 5, 6, 7, 8, 9, 10, 301, 302, 305, and 306.

P2 — **Physics II Disk** — contains the following 17 programs: 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 20A, 21, 35, 36, 40, 303, and 304.

C1 — **Chemistry I Disk** — contains the following 13 programs: 8, 9, 10, 11, 12, 22, 23, 24, 37, 38, 39, 303, and 306.

C2 — **Chemistry II Disk** — contains the following 13 programs: 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 307, 308, and 309.

M1 — **Senior High Math I Disk** — contains the following 13 programs: 701 - 713.

M2 — **Senior High Math II Disk** — contains the following 12 programs: 714 - 725.

M3 — **Junior High Math Disk** — contains the following 15 programs: 801 - 815.

V1 — **Senior High Vocabulary Disk** — contains the following 15 programs: 401 - 415.

V2 — **Junior High Vocabulary Disk** — contains the following 15 programs: 416 - 430.

Note: The cost of each diskette is $180.

***See Program List in Education Section**

Special Cassettes — These programs require a 16K environment and the Commodore 2040 drive.

901. **QUESLO** — permits the creation of source file used to generate individualized exams and homework assignments.

902. **QUEGEN** — accesses source files prepared by QUESLO and generates the exams and homework assignments.

903. **ANAL-I** — establishes class files for use with ANAL-II.

904. **ANAL-II** — grades and analyzes multiple-choice examinations. Provides mean, standard deviation, detailed item analysis, grade distribution, and assigns letter grade to each numerical grade.

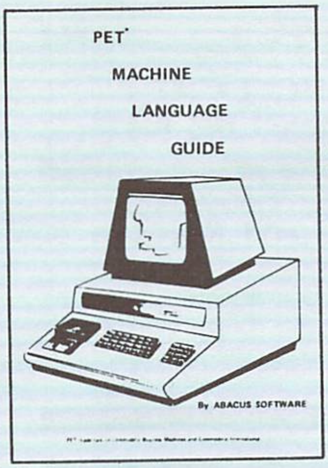
Note: The cost of each special cassette is $20. It is suggested that 901-902 and 903-904 be purchased together.

Note: Over 120 educational programs in math, chemistry, physics, and vocabulary are available for use on the 8K and 16K Commodre PET and CBM microcomputers. These programs may also be obtained on diskettes for use with the 2040 dual floppy drive.

Microphys Programs

2048 Ford Street
Brooklyn, New York 11229
(212) 646-0140

PET' MACHINE LANGUAGE GUIDE


PET*
MACHINE
LANGUAGE
GUIDE
By ABACUS SOFTWARE

Contents include sections on:

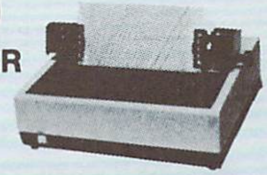
- Input and output routines.
- Fixed point, floating point, and Ascii number conversion.
- Clocks and timers.
- Built-in arithmetic functions.
- Programming hints and suggestions.
- Many sample programs.

If you are interested in or are already into machine language programming on the PET, then this invaluable guide is for you. More than 30 of the PET's built-in routines are fully detailed so that the reader can immediately put them to good use.

Available for $6.95 + .75 postage. Michigan residents please include 4% state sales tax. VISA and Mastercharge cards accepted - give card number and expiration date. Quantity discounts are available.

ABACUS SOFTWARE
P. O. Box 7211
Grand Rapids, Michigan 49510

THE BRAND NEW
EXCEL TX-80
DOT MATRIX PRINTER
ONLY $560.00



STANDARD FEATURES:

- 80 columns on plain paper with adjustable paper width
- 150 characters per second (70 lines per minute) throughput;
- Friction feed standard, tractor feed at $25 more
- 96 character set (upper and lower case) plus PET's* graphic set
- Elongated character (double width printing)
- Microprocessor control and self-test when power up
- Centronics compatible parallel interface
- 90 days warranty parts and labor

OPTIONAL INTERFACE BOARDS & CABLE SETS:

- PET*, APPLE II*, TRS-80* and serial interface board available at $60 each
- All our interface boards reside inside the printer and does not require extra power supply
- Cable for each interface is available at extra cost

SEND ORDERS TO:
P. O. Box 1147
El Cerrito, Calif. 94530
Phone: (415) 465-4240

TERMS:
• Checks, Master Charge and Visa accepted • Allow up to 4 weeks for delivery • Please add $15 per printer for shipping & handling • Calif. residents add 6% sales tax.

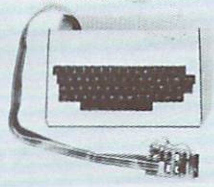
EXCEL COMPANY
MICRO COMPUTER SYSTEMS
618 GRAND AVENUE
OAKLAND, CALIF. 94610

We are the original PET* Keyboard Interface people

***Trade Marks of Commodore, Apple & Tandy Corp.**

PET^{tm} Keyboard Interface SALE

MODEL KBIF-3 SALE PRICE : $125.00

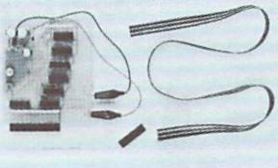


- Full all NEW ASCII Keyboard with upper & lower case letters. Case optional add $30 Interface installed and plugs into PET* and ready for use.
- Recognize all upper & lower case charactors numeric, punctuations and repeat key.
- 90% of all GRAPHICS are implemented.
- PET* keyboard can be used simultaneously.
- No modification to the PET* necessary.
- Completely assembled and checked out.

MODEL KBIF-2 SALE PRICE : $65.00

- SAME Interface as above without keyboard.
- Jumper selectable for data strobe polarity for your own keyboard.
- One ribbon cable and one connector included.

MODEL KBIF-1 SALE PRICE : $45.00



- INTERFACE with upper case characters, numeric and punctuations. Curser control set implemented.
- NO graphics, repeat key and lower case.
- Other features same as KBIF-2.

We accept checks, money order, VISA and MASTER CHARGE CARDS. Personal checks take 2 weeks to clear. Please ADD $6 for KBIF-3 and $3 for all others to cover shipping and handling within the continental U.S. Foreign orders please write for quote. Calif. residents add 6% sales tax. Allow upto 4 weeks for delivery. SEND FOR FREE SPECIFICATIONS.

EXCEL CO.
618 GRAND AVE
OAKLAND CALIF.
94610
TEL: (415) 465 4240

SEND ORDERS TO:

P. O. BOX 1147
EL CERRITO CALIF.
94530

ALL SALES END ON JAN. 31st. 1980

* PET is a registered trade make of Commodore Business Machine Inc.

$100 COUPON $100

Pre Christmas Special

$100 OFF

the APPLE
and
16K & 32K COMMODORE PET

offer good 'til Dec. 8, 1979

BYTE SHOP

the affordable computer store

218 N. Elm Street
Greensboro, N.C. 27410
919/275-2983

$100 COUPON $100

** CHRISTMAS BONUS! **

FREE CASSETTE OF YOUR CHOICE,
WITH PURCHASE OF PLEXI-VUE!

Purchase a PLEXI-VUE at the Regular Price of $14.95 and Receive a FREE Cassette of YOUR CHOICE! OFFER EXPIRES DEC. 15, 1979

SO ORDER NOW FOR EARLIEST DELIVERY!

ALL NEW SOFTWARE FITS ALL PETS/CBMS-$9.95 Each With Case

MEMORY TEST- This gives you 3 choices of tests to let you isolate bad memory, or test error message. Fast Machine Language Routine.

HOME UTILITIES- Combines Loans 1&2, Savings, Electricity and MPG to load at one time with menu. Makes a nice Demonstration Tape!

OTHELLO-OTHELLO/2-STRATEGY- Othello -vs-PET, or Friend. Strategy is like Mastermind, EXCEPT you can change Difficulty!

BOUNCE-CHASE-BREAKOUT- Famous Arcade games for your Enjoyment!

QUIZ MASTER- Enter your Questions, and Answers to create a Quiz. Use as Multiple Choice or Fill-in! Keeps total of Right answers.

TANK- A 2 Player action game. Both players can move at the same time! Nice Graphics, with no player lock-out.

SEND ALL
ORDERS
WITH $1.00
POSTAGE/
HANDLING
TO:

COMPETITIVE
SOFTWARE
21650 Maple Glen Drive
Edwardsburg, MI 49112

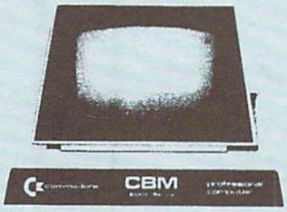
PET is Trademark of COMMODORE

Give your PET™ a new FACE!

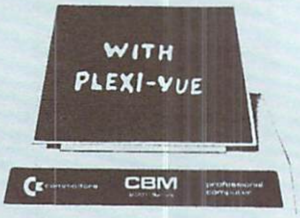
PLEXI-VUE™

High Contrast Viewing Screen

COMPARE:



HIGH CONTRAST!
LESS EYESTRAIN!
DECREASES GLARE!
FITS ALL PETS!
INSTALL IN 1 MINUTE!
Unbreakable LEXAN!



UPDATES APPEARANCE
Changes BLUE Fascia of Older
PETS to BLACK!
SEE WHITE LETTERS
ON A BLACK SCREEN!
SUG. RETAIL $14.95

ADVERTISEMENT

Important Advertisement — Please Note
If you are into machine language programming or just learning, you can not afford not to have this software. For details, please read on...

6502 Macro Assembler/Text Editor

General

Versions currently available for new & old PETs (with 16K memory), Apple II, and Sym on respective compatible tapes (Kim, Atari, Aim, and others coming soon)

Written entirely in machine language — not in BASIC, thus you get very fast and accurate assemblies

36 error codes, 26 commands, 22 pseudo ops

Occupies 8K memory starting at 2000 hex

Macro and conditional assembly capability

Creates relocatable object code on tape or executable code in memory

Vectors and special commands for use with disc operating systems

Each user is assigned a serial number for future reference and updating

Text Editor Features

Auto line numbering for easy source entry

String search command (FIND)

String search and replace command (EDIT)

String Search and conditionally replace by stepping thru file and prompting user for determination of replacement (EDIT)

Commands to copy and move one or more source lines (COPY, MOVE)

Duplicate command for duplicating and updating source lines (DUPLICATE)

Renumber source file command (NUMBER)

Command to delete one or more lines (DELETE)

Load and record commands (GET, PUT)

Source files can also be appended to current file (GET APPEND)

Each source file loaded results in a status summary consisting of length in bytes plus the address range where loaded

Assembler Features

Labels unique up to 10 characters. Labels may be made up of the following: @A-Z [\ ] ↑ ← . / 0-9 : ; < >   ?

Label expressions may be entered. Ex: LDA Table-Index +1

Hex, decimal, binary constants and ASCII strings may be stored

```
Ex: .By 'this is text string'
    .By %1101 $F3 49 'ABC' maskbyte
```

Can specify hi or lo part of label

```
Ex: LDA  #H,OP.TABEL      ; Load hi part of OP.Table
    LDA  #L, VALUE       ;Load lo part of Value
```

Free format input. Simply separate fields with one or more spaces and the fields will be automatically tabulated.

Conditional Assembly Operators: IFE, IFN, IFP, IFM, SET

Macro capability via .MD Pseudo OP (MACRO DEFINITION)

Non-repeating label capability for macros

Macros can be nested

Conditional Assembly can be incorporated within macros

Capability to store executable object code in memory and/or output relocatable object to tape during assembly

Can assemble source from memory or, for long programs, from tape or disc

Assembler can store object code in memory at a different address from its execution address if desired (VIA .MC PSEUDO OP). This is useful if object is to execute in memory space occupied by ASSM/TED

Complete listing can be generated during assembly (> ASSEM LIST) or an errors only listing can be generated.
Three ways to generate an errors only assembly:

VIA > ASSM NOLIST Command
VIA .LC PSEUDO OP
VIA Control O (↑O) when outputting

Command to output only the symbol table

Operating Features

Commands may be abbreviated to first 2 characters

Commands, Pseudo Ops, and Conditionals may be entered as upper or lower case characters

Machine language programs can be executed via Run command

User command for User Created Functions (USER)

Upper and lower boundaries for Text File and Symbol Table assume a default size on cold entry, but can be changed or displayed via set command

User Comments

"I am most impressed with your work and will be using it regularly from now on." — company in Illinois

"I was using TED/ASSM almost every day with great success and satisfaction. It is a real professional quality tool and very efficient." — systems consultant in New York

"Works like a charm... your Ted is really excellent — it is head and shoulders better than all other microprocessor based assembler/text editors." — physics professor in Canada

"I compliment you on the excellence of this software... As a macro assembler, it is in a class by itself for the 6502." — user in Virginia

"About 10 times better than any other assembler I've used." — California user

"The editor alone is an excellent start as a word processing package." — chemistry professor in Michigan

"The more I see of other assemblers, the more I am impressed with the capabilities of ASSM/TED." — user in California

Ordering Information

Users Manual and Cassette: $49.95 postage included (overseas add $3.00)

Specify either PET (old & new), Apple II, or Sym version
Check, money order, or company purchase order acceptable
Send order to: Carl W. Moser
3239 Linda Drive
Winston-Salem, N. C. 27106
Phone: (919) 748-8446 after 4:30 E.S.T.

Dealer discounts are available. Write for details.

If you like to use the graphics capability of your computer, a graphics drawing compiler is now available for the Assm/Ted. $29.95 postage included (overseas add $3.00)

STARFLEET ORION

A specially designed SF TACTICAL BATTLE GAME for your PET, TRS-80 or APPLE Computer.

The man called Sudden Smith watched the five blips on his screen spread out to meet the enemy. Two freighters converted into something like battlewagons, powerful but slow, and three real cruisers: the most powerful group of warships ever seen near the Promethean system – except for the Stellar Union fleet opposing them. Everyone was calling it Starfleet Orion, though it existed for only this day. It was life or death, and, after the object lesson on the planet Spring, everyone knew it.

STARFLEET ORION is a complete 2 player game system

- rule book
- battle manual
- cassette
- ship control sheets
- program listings

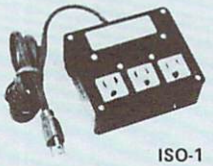
Includes 2 programs, 22 space ship types, and 12 playtested scenarios. Game mechanics are extremely simple, but play is exciting, challenging, and rich in detail. **Specify PET (8K), TRS-80 (Level II, 16K), or APPLE II (16K & 32K) $19.95.**

Ask your local dealer or send your check to:

Automated Simulations
Department J
P.O. Box 4232
Mountain View, CA. 94040

California residents please add 6% sales tax

DISK DRIVE WOES? PRINTER INTERACTION? MEMORY LOSS? ERRATIC OPERATION? DON'T BLAME THE SOFTWARE!


ISO-1

ISO-2

Power Line Spikes, Surges & Hash could be the culprit! Floppies, printers, memory & processor often interact! Our unique ISOLATORS eliminate equipment interaction AND curb damaging Power Line Spikes, Surges and Hash.

*ISOLATOR (ISO-1A) 3 filter isolated 3-prong sockets; integral Surge/Spike Suppression; 1875 W Maximum load, 1 KW load any socket	$54.95
*ISOLATOR (ISO-2) 2 filter isolated 3-prong socket banks; (6 sockets total); integral Spike/Surge Suppression; 1875 W Max load, 1 KW either bank	$54.95
*SUPER ISOLATOR (ISO-3), similar to ISO-1A except double filtering & Suppression	$79.95
*ISOLATOR (ISO-4), similar to ISO-1A except unit has 6 individually filtered sockets	$93.95
*ISOLATOR (ISO-5), similar to ISO-2 except unit has 3 socket banks, 9 sockets total	$76.95
*CIRCUIT BREAKER, any model (add-CB)	Add $ 6.00
*CKT BRKR/SWITCH/PILOT any model (-CBS)	Add $11.00

PHONE ORDERS 1-617-655-1532

ESP Electronic Specialists, Inc.
171 South Main Street, Natick, Mass. 01760

Dept.pg

DR. DALEY presents
Software for the PET and the APPLE

Dr. Daley's software is proud to announce the release of a package of our best selling programs.

These programs, regularly retailing for over $400, have been assembled into a single package for only $49.95. Included is our best selling TREK3, CHECKBOOK, and a mailing list, tutorials, games and puzzles for every member of the family. All attractively packaged in an album.

50 PROGRAMS ONLY $49.95

Your order will be shipped within four business days from receipt.

Charge your order to
MC/VISA

master charge
THE INTERBANK CARD

VISA

DR. DALEY, 425 Grove Avenue, Berrien Springs, Michigan 49103
Phone (616) 471-5514 Sun. thru Thurs., noon to 9 p.m. eastern time.

THE
apple
®
GAZETTE

Corvus 11A Disc Drive

A User's Review

by
Michael Tulloch
103 White Cr.
Niceville, Fla. 32578

Manufacturer
Corvus Systems, Inc.
900 S. Winchester Boulevard
San Jose, California 95128
408 725-0920

Would you spend 4 or 5 times more for a disk than you spent for your Apple computer? That's right, $5,300 for an Apple compatible disk. It may sound like a lot of money, but it might be money well spent if you've got large data files or many programs.

The Computer Store of Destin, Florida recently received their first Corvus 11A disc drive. The owner liked it so much that he took it home!

I've used the unit but most of the following information is based upon interviewing Gary Workman, the store owner. I'll tell you what the Corvus disc is, some of its physical specifications and our experience with the unit. If you run a business or do large data reduction programming, you'll find it worth investigating.

The disc unit itself is a space age enclosure of black metal and dark plexiglas. A round wire cable connects the drive to its power supply. A ribbon cable connects the drive to an interface board in the Apple. The interface board plugs into a slot just like most other Apple peripherals. Since the Corvus only occupies one slot, the Apple can still accommodate floppy discs.

High speed is another positive feature of the Corvus. I couldn't accurately measure the difference between the Corvus and the floppy, but I'd guess the Corvus is more than ten times faster in both read and write. This means that serial or random access searches of large data bases become really practical.

One of the most impressive of the Corvus disc features is its capacity. It is equivalent to 82 standard Apple discs: 9.6 megabytes are on line. Each of the 82 volumes are identical in size to an Apple floppy diskette. What is almost as impressive is that this capacity is packed into two moderate sized boxes. One contains the drive (an IMI 7710 "Winchester" hard disc) and drive electronics. It measures 8¼ x 6 x 18 inches. The other box is the power supply which is 4 x 5¼ x 15½ inches.

Documentation is, as usual in new computer products, a weak point. Eight pages, including the limited warranty, were all that came with the unit. Gary was able to get the thing up and running but a couple of calls to the manufacturer were required. Newer units are supposed to come with more complete documentation. In any case, be sure you're familiar with Apple's 3.2 DOS before you jump in. You can't hurt the disc but you sure can hurt your data.

On the positive side of the documentation issue is the excellent telephone help and complete compatability with Apple software.

Another nice feature is the aforementioned complete compatibility with Apple DOS. The Corvus is completely transparent to the user. The volume number in the Apple I/O commands selects the disc volume just like the slot number does with multiple floppy drives. The only software difference is a new command, "CATALOG V99" lists the first program name from each volume. Auto boot is also available.

Gary's Corvus disc has been in use for two weeks with no operating problems. The device incorporates several safety mechanisms so that "head crashes" are apparently a thing of the past. An auto-write-stop feature on power loss is just one of these.

When this unit was ordered they were quoting 2-3 weeks for delivery. Gary's took a month. Delivery now looks like two weeks. This may change as their sales increase.

My only strong dislike is the power switch. It is located on the power supply. The power supply is massive and looks out of place among all the other sleek computer parts. It's unfortunate the power supply can't be hidden somewhere.

The Corvus seems an ideal mass memory device for a business, professional, or other interest requiring large information storage. Its price is steep for strictly hobby use. But for those who can afford it, or need it, it really helps make a small computer into The Big Apple.

APPLE RESOURCES

Apple Computer, Inc.
10260 Bandley Drive
Cupertino, CA 95051

Compute.
Apple Coordinator
900 Spring Garden St.
Greensboro, NC 27403

Mountain Hardware
300 Harvey West Blvd.
Santa Cruz, CA 95060

Personal Software
592 Weddell Drive
Sunnyvale, CA 94086

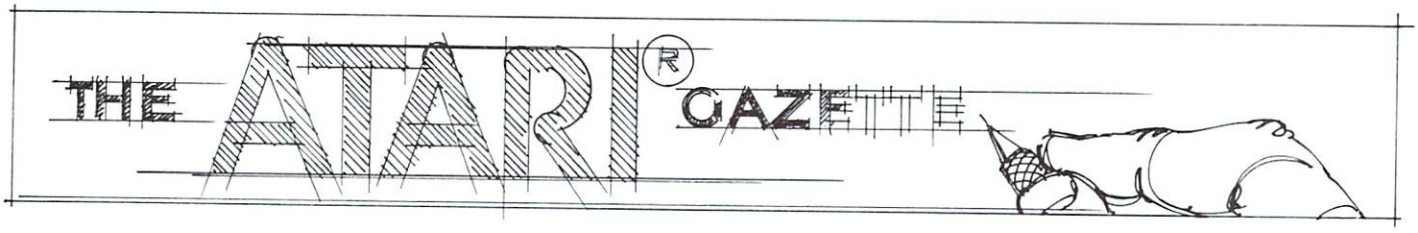
Automated Simulations
Dept. J
P.O. Box 4232
Mountain View, CA 94040

Programma
3400 Wilshire Blvd.
Los Angeles, CA 90010

Rainbow Computing, Inc.
Garden Plaza Shopping Center
9719 Reseda Blvd.
Northridge, CA 91324

SSM
2116 Walsh Ave.
Santa Clara, CA 95050

Sub Logic
Box V
Savoy, IL 61874



ATARI COMPUTERS: THE ULTIMATE TEACHING MACHINES?

John Victor, President
Program Design, Inc.
11 Idar Court
Greenwich, CT 06830

The first microcomputer systems were not designed with any particular purpose in mind. They were all-purpose machines. As a result, they had to be designed for all possible configurations with plenty of slots for memory boards, large power supplies, cooling fans, etc. First generation computers were expensive, and many users were paying for features they did not need.

The next generation of microcomputers eliminated the big boxes of the first generation computers, and the video terminal and computer were combined into one unit. Tremendous cost reductions were achieved, but the results were definitely not all-purpose machines. Rather, they were devices targeted for use by schools, small businesses and software hobbyists. The Radio Shack TRS-80, Commodore PET and apple computers became the top sellers of this second generation.

With the introduction of the Atari line of computers we are seeing a third generation of microcomputer — not just from the hardware end but also from a marketing approach. These computers are slightly cheaper than those of the previous generation. The major difference is in the configuration and the application for which the systems were designed. A recent article in *on-Computing* described the Atari computers as hybrids — a cross between a video game and a small computer. Actually the systems have incorporated the best features from both creating a true personal and home computer system. These systems are excellently suited for the educational and recreational interests of the consumer market.

The Atari computers can be operated in three distinct modes: (1) as a regular BASIC-speaking microcomputer, (2) as an audio-visual teaching system, and (3) as a regular Atari video game machine. In addition to the normal computer functions the Atari computer can run an audio cassette from within a BASIC program or along with its educational ROM cartridge. The marketing people at Atari have obviously discovered the consumer market for educational materials (which is easily 10 times as large as the school market).

For the last few months I have had the opportunity to use both the Atari 400 and 800 models for program development, and I will relate some of my discoveries about the possibilities of these systems in a series of 3 articles. The first will cover an overview of the Atari system, the second will cover Atari BASIC, and the third will cover applications for this type of system.

THE ATARI AT A GLANCE

MICROPROCESSOR: 6502. (It is my understanding that a second 6502 handles the video display and graphics.)

MODELS: 400 and 800. 400 is non-expandable with 8K memory. 800 is expandable with plug-in modules.

PRICE: 400 is in $500 range — 800 is in $1000 range.

VIDEO: User's color TV set. Connects thru built-in RF modulator (FCC approved)

LANGUAGES AVAILABLE: BASIC supplied in plug-in ROM

BASIC GRAPHICS: Full color. Several different graphics modes — low to high resolution. Pseudo-graphics and special characters available in text modes.

TEXT: 3 text modes with different type sizes. Upper and lower case, reverse characters, special characters, control characters. 40 by 24 display in regular type mode.

SOUND: 4 sound registers and bell.

MEMORY: 800 can be expanded to 48K thru memory modules.

WANTED: ATARI®

● ● ● FIND IT AT COMPUTERWORLD.

ATARI® 800™

PERSONAL COMPUTER SYSTEM

PRICE INCLUDES:

Computer Console
BASIC Language Cartridge
Education System Master Cartridge
BASIC Language Programming Manual (Wiley)
800 Operator's Manual with Note Book
ATARI 410 Program Recorder
Guide to BASIC Programming Cassette
8K RAM Module•Power Supply•
TV Switch Box

$999.99

ATARI® 400™

PERSONAL COMPUTER SYSTEM

PRICE INCLUDES:

Computer Console
BASIC Language Cartridge
BASIC Language Programming Manual (Wiley)
400 Operator's Manual with Note Book
Power Supply
TV Switch Box

$549.99

PERIPHERALS AND ACCESSORIES

ATARI® 810™ DISC DRIVE* **$749.99**

DISKETTES

CX8100 BLANK DISKETTES*
CX8101 DISK FILE MANAGER*
$5.00/ea.

ATARI® 820™ PRINTER* **$599.99**

ACCESSORY CONTROLLERS

CX2C-01 DRIVING CONTROLLER PAIR
CX30-04 PADDLE CONTROLLER PAIR
CX40-04 JOYSTICK CONTROLLER PAIR
$19.95/ea.

ATARI® 410™ PROGRAM RECORDER **$89.99**

ADD-ON MEMORY (800 ONLY)

CX852 8K RAM MEMORY MODULE $124.99
CX853 16K RAM MEMORY MODULE $249.99

SOFTWARE

ROM CARTRIDGES

CXL4001 EDUCATION SYSTEM MASTER CARTRIDGE $34.99
KEY: (j) = uses joystick controller
(p) = uses paddle controller
(d) = uses driving controller

GAMES .... $49.99/ea.

CXL4004 BASKETBALL .... (j)
CXL4005 LIFE .... (j)
CXL4006 SUPER BREAKOUT™ .... (p)
CX4008 SUPER BUG™** .... (d)

APPLICATION $69.99

CXL4002 ATARI BASIC
CXL4003 ASSEMBLER DEBUG**
CXL4007 MUSIC COMPOSER
CXL4009 COMPUTER CHESS** .... (j)

EDUCATION SYSTEM CASSETTE PROGRAMS **$39.99/ea.**

CX6001 U.S. HISTORY
CX6002 U.S. GOVERNMENT
CX6003 SUPERVISORY SKILLS
CX6004 WORLD HISTORY (WESTERN)
CX6005 BASIC SOCIOLOGY
CX6006 COUNSELING PROCEDURES
CX6007 PRINCIPLES OF ACCOUNTING
CX6008 PHYSICS
CX6009 GREAT CLASSICS (ENGLISH)
CX6010 BUSINESS COMMUNICATIONS
CX6011 BASIC PSYCHOLOGY
CX6012 EFFECTIVE WRITING
CX6013 AUTO MECHANICS
CX6014 PRINCIPLES OF ECONOMICS
CX6015 SPELLING
CX6016 BASIC ELECTRICITY
CX6017 BASIC ALGEBRA

BASIC GAME AND PROGRAM CASSETTES

CX4101 GUIDE TO BASIC PROGRAMMING*
CX4102 BASIC GAME PROGRAMS*

$29.95/ea.

*October Delivery **November Delivery

—Prices subject to change.—

We Promise to Deliver!

- We GUARANTEE ship dates on prepaid Computer System orders.*
- If for reasons beyond our control we miss a ship date, WE WILL REFUND THE SHIPPING AND HANDLING CHARGES TO YOU — PLUS GIVE YOU A 10% DISCOUNT ON YOUR NEXT PURCHASE OF ANY ATARI SOFTWARE!
- For prepaid Computer System orders, you'll receive an Accessory Controller of your choice.

*All prepaid orders must be for full amount by Cashier's Check only, payable to ComputerWorld. California residents, please add 6% sales tax.

ORDERING INFORMATION:

TELEX 182274

1. Type or print item(s) you wish to order.
2. If you pay by personal check: please allow 2 weeks for personal check to clear.
3. If you pay with bank card: We accept VISA, BankAmericard, MasterCharge. Please include bank card number, card expiration date, and your signature.
4. Add 50¢ for postage and handling of books, manuals, catalogs, and magazines. Add $10.00 for shipping, handling, and insurance for hardware and systems orders.
5. Send orders to ComputerWorld, 6791 Westminster Ave., Westminster, CA 92683. California residents, please add 6% sales tax.

ComputerWorld

A RAYGAM COMPANY

6791 Westminster Ave., Westminster, CA 92683 (714) 891-2587

PERIPHERALS AVAILABLE: game paddles, cassette storage, disk drive, printer

CASSETTE: Dedicated unit supplied by Atari. 600 baud. Recording method similar to Kansas City standard.

THE COMPANY

The most important feature of a computer is not to be found in the computer itself, but rather in the company manufacturing the computer. The failures in most other small computers has not been in the basic design but rather in the type of support the computer gets from its creator.

For example, the TRS-80 design is essentially very good. The failures of the system can be laid to Radio Shack (and its parent company Tandy) which I like to describe as a "19th century company trying to deal with a 21st century technology." Radio Shack has done well marketing and servicing the TRS-80. However, when it came to research, development, design, and other creative activities, the company was in well over its head. (Note that the basic design came from outside the organization!)

Atari, in contrast, is well suited for this type of business. Their internal structure is unbureaucratic and solutions oriented. I believe that their top management understands the electronics and the marketing of electronics.

This is not to say that Atari hasn't made mistakes, or won't make mistakes. What I will say is that this company learns from its mistakes. They are strictly a class operation.

Atari's crucial edge in this business is that they understand the importance of software. To this end they are supporting software development from both within and outside the company. In contrast, Tandy and Commodore seem to be discouraging the outside development of software with a lack of regard for making hardware and software changes compatible from older to newer machines.

ATARI 400 AND 800

The Atari computers come in two models: 400 and 800. The 400 is much less expensive and is non-expandable. It also uses a flat, solid state keyboard. The 800 is very much like the Apple II in appearance, and is expandable using plug-in cartridges.

The non-expandability of the 400 is a problem. When working in BASIC, the operating system gobbles up almost 3K of the computer's memory leaving 5K for the user to work with. I don't think that 8K is enough — 16K would have been much better. Otherwise, the system is OK. I happen to like the solid state keyboard if the choice is between it and an inexpensive mechanical keyboard like the one on the Ohio Scientific Challenger IP. (Solid state key beeps when hit.)

The modular construction of the 800 makes expansion the simplest thing imaginable. Add more memory? Even the most technically naive consumer can do it. without bringing the computer back to the store!

Since the language ROM is contained in a cartridge, it will be a simple matter to change languages with this system. If this system had been available for the TRS-80 Level I and II, then there would now be ten times as much software available for the Radio Shack computer as there now is.

PROGRAM STORAGE

There are three modes of program storage for the Atari system: plug-in ROMs, audio cassette, or disk. The plug-in ROMs are great for mass market programs such as microchess. However, they are expensive and must be manufactured in quantities of around 30,000. Most applications programs would not qualify for this type of storage. (The decision of Texas Instruments and other companies to make their systems primarily ROM based may very well eliminate most of the software support for their systems!)

One of the best features of the Atari computer is the audio cassette storage capability. Atari obviously learned from the mistakes of Commodore and others regarding cassette recording formats. They picked a highly reliable system based on two tones for encoding digital information — 0 is represented by one tone, and 1 by another. The cassette unit supplied has the audio controls removed.

The cassette format is unaffected by small differences in recording level, drop outs, head misalignment, dirty heads, etc. — all of the things that would reck havoc with a PET, Apple or TRS-80 tape. However, this system cannot tolerate speed variations. Cheap cassette casings and home-brew duplication will not go over very well with this system.

There is also another problem: the computer must see a program within so many seconds of a CLOAD command. Therefore, the tape must be carefully positioned before loading a program.

The Atari cassette unit is stereo — one track records digital information for program storage and a second can play back audio voice recording. This system can play a voice to go along with educational programs under computer control. The voice is played back through the user's TV set.

The Atari disk system transmits data serial fashion. This makes data transfer much slower than a system (such as Apple's) that transmits data in parellel. This was done so that the Atari system could gain FCC approval — a parallel connection produces too much radio frequency interference.

NEXT A REVIEW OF ATARI BASIC AND GRAPHICS

ATARI RESOURCES

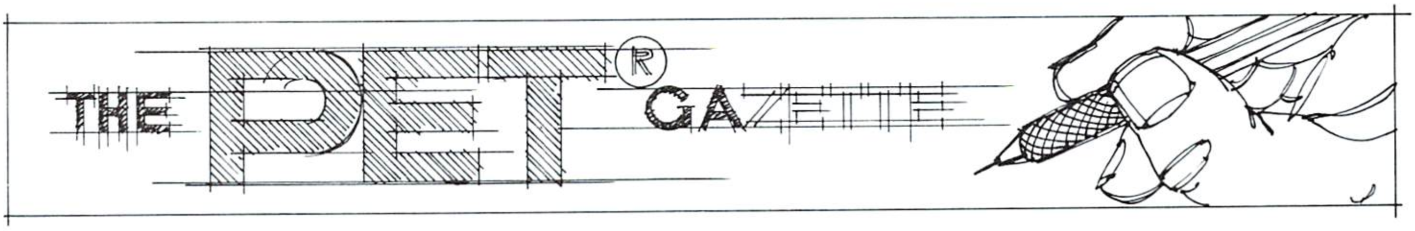
Atari, Inc.
1265 Borregas Ave.
Sunnyvale, CA 94086

Compute.
Atari Coordinator
900 Spring Garden St.
Greensboro, NC 27403

Iridis Magazine
Box 550
Goleta, CA 93017

Personal Software
592 Weddell Drive
Sunnyvale, CA 94086

Program Design, Inc.
11 Idar Court
Greenwich, CT 06830



THE EVOLUTION OF A MAGAZINE

by Len Lindsay

April 1978 marked the beginning of the PET GAZETTE. It was begun by an enthusiastic, active, involved dreamer. There were, of course, high hopes, but it's beginning was quite modest. A little background about it's founder may be of use.

WRITING. When I put together the first PET GAZETTE, I had a background that helped to get it started and grow. I previously was the editor, typist, etc. for a college newspaper. Thus at the beginning I knew how much time and effort a newsletter takes. (It is estimated about 10 hours per page for a newsletter editor, if he doesn't do the typing — I did the typing too!) I also was familiar with printers and camera ready copy. But a good writer I was not. In fact, my college English professor said that I was one of the worst writers she had ever seen. But maybe that was one of the reasons the GAZETTE grew. It was not stuffy and gramatically precise, but rather down to earth. I believe what one says is more important than how one says it (as long as your readers understand what you mean).

DECISION. The decision to specialize in the PET was made after analyzing the information in all the magazines and 5 full file cabinet drawers. It appeared to be the computer of the future, for the everyday person. The decision to buy a PET was made, and the first issue of the PET GAZETTE was compiled. My PET did not arrive until MAY of 1978. Thus, my first issue was written, printed and mailed before I even had a PET.

DISTRIBUTION. The first issue was mailed to every name and address that could be found connected to the PET via an article or ad. News releases were sent to various publications. I was determined to provide information for PET users free of charge.

PROGRAMMING. I did not know BASIC very well when the PET first arrived, but learned PET BASIC very fast using my PET to help me. I don't know any other computer language. However, most PET users also seem to be in that position when they first get their PET so my articles may have been more relevant to them.

THE EVOLUTION BEGINS. The PET GAZETTE was originally to be a resource guide, to give all PET users one place to look to find any PET company's address, a list of products for the PET etc. The first issue listed two PET groups and 4 magazines. A list of 15 PET related magazine articles was printed. The list of PET related products amounted to only 4. The software list included 11 known sources and a FREE cassette program exchange was announced along with some guides for programs and their submission. Peoples' Computers Graphic and Special Character LISTING conventions were mentioned and supported. This trend of proposing standards to help the user avoid the trap of everyone doing it a bit different was continued in future issues.

SECOND ISSUE. The second issue was twice as large. This issue contained one half page ad. The Software list increased and listed specific programs and prices. The number of PET groups listed doubled to 4. The list of PET accessories increased from 4 to 11 companies, and there now were 3 pages for standards and Cassette Exchange information. This issue was published in MAY 1978, just before I received my PET. I had no PET programs myself, and luckily no one had submitted programs for exchange. I did worry about what would happen if delivery of my PET were late. Fortunately, I received my PET in time. And then I was embarrassed that in my second issue, one of my programming suggestions to improve readability of BASIC wouldn't work on the PET. I had advised indenting the inside of each FOR ... NEXT loop by one space. But I found that the PET ignores all extra spaces between the line number and the start of the commands. Thus you could leave the extra spaces as you typed in the program, but when listed they would be gone. I wonder how many of my then almost 100 readers realized that at the printing of my 2nd issue of the PET GAZETTE, I still did not have a PET?

ISSUE THREE. The growth trend continued. The third issue was three times the size of the previous issue, now weighing in at 24 pages. Advertisements now took up about 8 pages. Advertising rates were kept extremely low as an incentive to get a lot of ads. I felt the PET users would appreciate being able to see all the PET products advertised in one place. There were now 2 full pages listing PET related magazine articles. The Software list expanded to 2½ pages. Now that I had a PET I began carefully looking at programs on the market for the PET. My reviews covered 4 pages, and began what was to become a main emphasis in the PET GAZETTE — informing PET users what to expect from programs purchased.

FOUR BRINGS PROBLEMS. This was my last monthly issue. It's 40 pages presented a problem: collating it by hand and then stapling it together. This wasn't too bad before with fewer pages and less copies. But my mailing list continued its trend of doubling each issue. 400 copies to collate, fold, staple, address, and mail is quite a chore. To save on postage, I acquired a bulk rate mailing permit. I retained the size to keep it a handy little reference publication. The mailing list was put onto metal addressograph plates. A printer in town was kind enough to do this for me. He also had collating and paper folding machines. They helped, but it still took a few days of solid work for myself and the couple of people that I talked into helping me.

Sound capability was now being added to the PET and when this issue came out, at least 3 methods, all incompatible, were being used. The simplest one was chosen to be proposed as the convention for adding sound to programs. All it took was 2 wires and a speaker/amplifier. And the programming was rather simple too. This convention did become standard and is often referred to as the GAZETTE sound convention. Almost all programs using sound use this convention. This kept the exchange of programs compatible.

This issue also began my WARNING. *** Never buy a product unless you are sure it exists ***. This was right on the cover of the issue. Every issue from this point on contained a similar warning on the cover or 1st page. This of course made product reviews very important. It also helped PET users to be wise buyers. I never printed a review of a product that did not exist. In addition to the reviews, PET programming tips were expanded. The GAZETTE was now more than just a guide to PET resources, it was an information guide as well.

LAST OF THE HANDY SIZE.

This issue was the first where I had too much material to print, and could not afford to print and mail it all. Only about half of the material was chosen to be printed. The list of PET companies now covered 3 pages, with 4 columns on each page. Listing of PET programs began in this issue with FILE MANAGER, a program to help users with data files. Now, the bulk of the GAZETTE was helpful information and programming tips. My mail was increasing and many people were sending in information to print for the benefit of my readers. I was very happy with the generally enthusiastic and friendly attitude of most PET users. It really seemed that we had a PET community.

A MAJOR TURNING POINT. I decided to double the size from 5½x8½ to 8½x11. The GAZETTE had by now become a magazine. I converted my mailing list and arranged for another company to manage it for me.

Advertisers in this first large size issue were lucky. They paid for a full 5½x8½ page ad and received an ad twice that size, due to the page size doubling. I now had over 25 reviews printed, and several more that didn't get included until the next issue. The cover now was a beautiful photo of the PET in outer space, which I designed. I am very happy with that cover photo. The workings of the PET were also uncovered and a machine language program listing was included.

Perhaps the most significant change was that I now was using my PET to do my magazine. I had a Word Processing Program and printer. If it weren't for that I would not have been able to keep up the GAZETTE.

THE BEST. Due to requests for back issues which no longer were available I decided to compile all my previous information together with my new information and publish a BEST OF THE PET GAZETTE. I printed 4,000 copies of this 100 page book. It included over 100 product reviews, 20 program listings, and a ton of information. Company addresses were printed along the left side of 9 consecutive pages so as to be easy to flip through to find any company's address. Copies of this excellent resource and information guide are still available from COMPUTE at $10 each.

SPRING '79 ISSUE. The GAZETTE now included art work and parts of it were typeset. Almost 60 more products were reviewed. I now was receiving reviews in the mail from enthusiastic readers. Some reviews came on tape, which provided data for my Word Processor Program. I then could print out the review on my printer in any size column to fit the space available on the page.

SUMMER '79. This issue brought all the problems to a head. It took almost 2 months to get it back from the printer, and another month before it was mailed by the company managing my subscription list. I had no control over all these delays, and was very frustrated. This, combined with being overworked and having to spend the majority of my time with "business" rather than with "computing" led to a sad state of affairs. The quality of my writing could not remain high when I had only enough time to put out first drafts, which were then printed. This is far from ideal. But by now there were thousands of PET users depending on the GAZETTE and I did not have the heart to just quit. Small System Services called . What do you know! They were interested in publishing the GAZETTE. After a few letters and phone conversations it was decided that they could carry on the GAZETTE and improve it immensely. How could I refuse that? The GAZETTE now reached its turning point, and it looked like a turn for the BEST.

THE NEW PET GAZETTE. Small System Services now is publisher of the PET GAZETTE. They decided to change its name to COMPUTE, the Journal for Progressive Computing. Emphasis on the PET remains, but other 6502 computing systems will also be covered, including the new, not yet released ATARI! In addition to all that, COMPUTE will have its own booth at three major fall computer shows (Boston, Atlanta, Philadelphia). The fall super issue of COMPUTE looks promising indeed, with about 10,000 copies to be distributed. All this, and it should get even better. Watch for my program review roundup in the next issue. I'll be here, hope you will be too.

10-DAY FREE TRIAL

Send for our FREE Catalog

WE BUY USED PET, APPLE and TRS-80 COMPUTERS

$100 FREE ACCESSORIES WITH 16K or 32K PET

Buy our 16K or 32K PET and we'll give you your first $100 worth of accessories. **FREE.** Just indicate on your order that you have reduced the cost of your accessories by $100.

FREE Terminal Package with 8K PETs

SAVE $69

4K - Keyboard C	$ 595
8K - Keyboard C	$ 795
16K - Keyboard B	$ 995
16K - Keyboard N	$ 995
32K - Keyboard C	$1295
32K - Keyboard B	$1295
32K - Keyboard N	$1295

C — calculator keyboard (only version with tape deck)
B — Large Keyboard (graphics not on keys)
N — large keyboard with graphics symbols

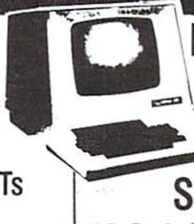
Used 8K PET with 90-day warranty	$650

PET ACCESSORIES

Commodore Dual Floppy Disk Drive	$1 SALE!
Commodore Printer (tractor feed)	$995.00
Commodore Printer (friction feed)	$995.00
Second Cassette — from Commodore	$95.00
Commodore PET Service Kit	$30.00
Beeper - Tells when tape is loaded	$24.95
Petunia - Play music from PET	$29.95
Video Buffer - Attach another CRT	$29.95
Combo - Petunia and Video Buffer	$49.95
New Serial Printer Interface for PET	$79.95

Call for Availability ______

PET - Compatible Selectric in Desk	$895.00



Hazeltine 1400

LIST SALE
~~$850~~ ~~$749~~

SUPER SALE PRICE TOO LOW TO ADVERTISE

Immediate Delivery — 2-Year Factory Warranty

You may have seen the Hazeltine advertised at $850. You may have seen it sale prices at $749 or even $699 but our new price is so low that we can't even advertise it. Call us for a quote. Hurry, we have a limited quantity at this price. The 8048-based Hazeltine 1400 has a 12" screen, 24 x 80 display, TTY-style keyboard, addressable cursor, and RS-232 I/O from 110 to 9600 baud.

Hazeltine 1410 — $835
Hazeltine 1500 — $1069
Hazeltine 1510 — $1195
Hazeltine 1520 — $1499

SPECIAL

SAVE $195

COMMODORE DISK DRIVES

Reg. $1,295 Sale $1,100

PET OWNERS . . .

REMOTE TERMINAL for only $69

A self-contained module and program cassette enables your PET to function as a 300 baud terminal. Supports Upper/Lower case, Rubout, Escape & all control functions. Output is TTL.

FREE WITH 8K PET PURCHASE

NEW! 800K

DISK & MEMORY EXPANSION

You can instantly turn your PET into a speedy and efficient professional computer. Its easy with the new 400K Disk Drive and Memory Expansion from Computhink Add up to 32K internally then load 20K program in only 3 seconds!

800K Disk Drive	$1,295.00
Memory Expansion 16K	$425.00
24K	$525.00
32K	$615.00

CAT COUPLER

New 300 baud Originate/Answer Acoustic Coupler. Looks good, works great

priced at $189

LOW COST PRINTER FOR PET

$395

This is a completely refurbished Teletype KSR 33 terminal ready to attach to your PET's interface to use as a printer.

IN STOCK NOW

apple II *plus*

$200 FREE ACCESSORIES

The new Apple II with Applesoft BASIC built-in! Eliminates the need for a $200 Firmware Card and includes new Autostart ROM for easy operation. This combined with the FREE accessories from NCE could save you up to $400 on a 48K Apple II system!

16K Apple II Plus — $1195 (take $100 in free accessories)
32K Apple II Plus — $1345 (take $150 in free accessories)
48K Apple II Plus — $1495 (take $200 in free accessories)

Apple II Accessories

Centronics Printer Interface		$225
Disk and Controller	Call for Availability	$595
Second Disk Drive		$495
Parallel Printer Card		$180
Communications Card	Call for Availability	$225
Hi-Speed Serial Card	Call for Availability	$195
Firmware Card	Call for Availability	$200
Hobby/Proto Card		$24
Microverter RF Mod.		$35
Sanyo M2544 Recorder		$55

IN STOCK NOW!

EVERY ITEM IN THIS ADVERTISEMENT IS IN STOCK AND READY TO SHIP, EXCEPT WHERE NOTED.

NOW $1,098 Graphics printer for Apple II

Now you can print high resolution graphics from your Apple using the IP-225 printer and graphics option from IDS. The IP-225 is a tractor feed printer with 96 possible characters. Line length is 80/132 col. with a speed of 50/80 cps. We include software which allows it to use either parallel or serial interface at 1200 baud. ABSOLUTELY FREE (you save $50)!

Selectric·Based Desktop Terminal $319

Super bargain, while they last. A desktop terminal basd on an IBM Selectric typewriter for only $319, including documentation. These terminals were originally designed for use with timesharing systems where top-quality printing was required. The IBM keyboard and printer are separated by a three foot cable and each has its own enclosure (great for custom installations). Serial RS-232 interface uses PTTC instead of ASCII codes so you will need to write a conversion program (we have no ASCII interface for this model). 14.8 cps, 134.5 baud, 13" line length, pica. Sold in "AS-IS" condition. Pre-sale preparations include:

- Motors checked and guaranteed before sale.
- The machines are complete.
- All indicator lights work.
- New ribbon & cleaned type element, on/off switches, tab & carriage return cards, & tab set clear.

There is a 3-day return privilege on these machines and any missing parts will be replaced.

1+1=3·RIGHT!

EDUCATORS ORDER YOUR FREE PET TODAY!

Between now and Nov. 30th any educational institution which buys 2 PET's at list price will receive a 3rd PET, **ABSOLUTELY FREE!** That's right, FREE! For example, buy 2 8K PET's at $795 each and get 1 8K PET, FREE. Buy 1 16K at $995 and 1 32K at $1,295 and your school will receive 1 16K PET absolutely FREE! Join the hundreds of public & private schools, colleges, and Universities who have bought from us with confidence. Look at our PET box in the upper left hand corner of this ad for descriptions and prices of the Commodore PET product line. **If you need more information just call, we love questions.**

SANYO MONITOR

$169 $279
9-inch ~~$240~~ 15-inch ~~$400~~

CompuMart SINCE 1971

1250 North Main Street, DepartmentCOA9
P.O. Box 8610 Ann Arbor, Michigan 48107

(313) 994-3200

VISA

Member:
Computer Dealers
Association

IMPORTANT ORDERING INFORMATION
All orders must include 4% shipping and handling. Michigan residents add 4% for state sales tax. All foreign orders (except Canada) need an additional 10% for shipping and handling.

Phones open from 9:00 a.m. to 7:00 p.m. EST Monday-Friday, 10:00 a.m. to 5:00 p.m. Saturdays • P.O.'s accepted from D & B rated companies — shipment contingent upon receipt of signed purchase order • All prices subject to change without notice • Most items in stock for immediate shipment — call for delivery quotation • Sorry, no C.O.D.'s • In the Ann Arbor area? Retail store open 11:00 a.m. to 7:00 p.m. Tuesday-Friday, 10:00 a.m.to 5:00 p.m. Saturdays (Closed Sunday and Monday)

If not satisfied, return your purchase with-in 10 days for full refund of purchase price!

PET In Transition

Jim Butterfield, Toronto

A transition issue of the PET GAZETTE is very appropriate, because the PET itself is in transition. New products and new software are going to change the nature of the machine. Old hands at PET system use will have to learn new tricks.

A lot of "old" software won't work on the new machines. Those chess and music playing programs, for example, can't make the transition in their present form. Many of the POKEs and PEEKs have shifted to new locations. SYS, USR and WAIT commands will need reworking.

The machines themselves have a few hardware changes. A new memory arrangement eliminates screen hash. The screen can no longer be blanked, so that certain special effects (explosions, etc.) are difficult to achieve. The character generator has changed, giving an unfamiliar reversal of upper and lower case. The memory expansion edge connector is physically different; it appears as if Commodore doesn't intend it to be user accessible any more. Instead, a "mother board" architecture is hinted at; and empty ROM sockets suggest that new software may be forthcoming. An assembler? New languages? It's anybody's guess right now.

Further hardware changes are rumoured. Most of the ones I hear are associated with screen format changes (80 characters? Colour? Programmable characters?)

With all these changes, what should the PET owner do? Stay with his original machine? Retrofit with the new ROM chips? Buy the new model?

My recommendation is this: upgrade with new ROMs, or buy a new unit; but either way, take the plunge. You'll want the new model if you are strong on large keyboards, green screens, and/or ROM expansion capability; otherwise, stay with your existing machines but fit the new ROM programs.

There's too much good stuff in the new software to hold back. The limit on array size is lifted; tape files behave correctly; the IEEE-488 bus works better; the built-in Machine Language Monitor is very valuable; you can now pull the computer out of a total crash without losing memory; and numerous little improvements have been made.

Commodore may introduce more ROM's in the future. But I believe that they won't tinker with lower memory (locations 0 to 1023 decimal) to any great extent. So an upgrade which is made now should last for a while.

Commercial software houses will have to wrestle with the upgrade, of course. Buyers will have to closely examine programs on sale to make sure that they are compatible with their computer model. "AC/DC" programs, which will run on any existing ROM, will be a help (I understand that such a version of Microchess will soon be available). Eventually, I believe that the upgraded ROMs will become standard, and most software will be written for them; the original ROM will fade out of the picture.

Clubs, and newsletters like The PET GAZETTE, will also need to cope with this transition. Programs and techniques will have to be carefully identified: which ROM set will they work on? Where possible, two versions will be desirable.

Eventually — hopefully — we'll all settle back into a standard machine. And then we can focus our attention fully on the main objective: making it do the jobs we want to do.

Memory locations for ROM upgrade on PET computers

Jim Butterfield, Toronto

0000-0002	0-2	USR Jump instruction
0003	3	Search character
0004	4	Scan-between-quotes flag
0005	5	Basic input buffer pointer; # subscripts
0006	6	Default DIM flag
0007	7	Type: FF = string, 00 = numeric
0008	8	Type: 80 = integer, 00 = floating point
0009	9	DATA scan flag; LIST quote flag; memory flag
000A	10	Subscript flag; FNx flag
000B	11	0 = input; 64 = get; 152 = read
000C	12	ATN sign flag; comparison evaluation flag
000D	13	input flag; suppress output if negative
000E	14	current I/O device for prompt-suppress
0011-0012	17-18	Basic integer address (for SYS, GOTO, etc.)
0013	19	Temporary string descriptor stack pointer
0014-0015	20-21	Last temporary string vector
0016-001E	22-30	Stack of descriptors for temporary strings
001F-0020	31-32	Pointer for number transfer
0021-0022	33-34	Misc. number pointer
0023-0027	35-39	Product staging area for multiplication
0028-0029	40-41	Pointer: Start-of-Basic memory
002A-002B	42-43	Pointer: End-of-Basic, Start-of-Variables
002C-002D	44-45	Pointer: End-of-Variables, Start-of-Arrays
002E-002F	46-47	Pointer: End-of-Arrays
0030-0031	48-49	Pointer: Bottom-of-strings (moving down)
0032-0033	50-51	Utility string pointer
0034-0035	52-53	Pointer: Limit of Basic Memory
0036-0037	54-55	Current Basic line number
0038-0039	56-57	Previous Basic line number
003A-003B	58-59	Pointer to Basic statement (for CONT)
003C-003D	60-61	Line number, current DATA line
003E-003F	62-63	Pointer to current DATA item
0040-0041	64-65	Input vector
0042-0043	66-67	Current variable name
0044-0045	68-69	Current variable address
0046-0047	70-71	Variable pointer for FOR/NEXT
0048	72	Y save register; new-operator save
004A	74	Comparison symbol accumulator
004B-004C	75-76	Misc. numeric work area
004D-0050	77-80	Work area; garbage yardstick
0051-0053	81-83	Jump vector for functions
0054-0058	84-88	Misc. numeric storage area

Pamper your PET...

...with HAYDEN COMPUTER PROGRAM TAPES.

Indulge your PET with complete, ready-to-run, bug-free programs that are recreational, educational, and just plain fun! Full documentation accompanies each tape or can be found in books with the same title (available separately). And, they come with a warranty against manufacturer's defect.

Hayden publishes new programs every month. Just look at what you can spoil your PET with now . . .

BACKGAMMON . . . The classic game of skill and luck played between you and a preprogrammed opponent. Full documentation included (FDI). *#02501, $10.95*

BATTER UP!! . . . Action-packed baseball with 3 levels of display. It will challenge your reaction time and logic. FDI. *#02801, $10.95*

COMPLEX MATHEMATICS . . . 8 programs that give the user the ability to perform computations of complex numbers in BASIC rather than in FORTRAN. FDI. *#01201, $14.95*

CROSSBOW . . . Features a target game that, besides offering hours of fun, teaches fractions in an exciting and competitive environment. Includes 3 levels of play. FDI. *#02701, $9.95*

ENGINEERING MATHEMATICS — 1 . . . Contains 8 programs useful to the engineer such as; Integration by Simpson's Rule, Quadratic Equations (covering all 3 root cases), etc. FDI. *#01301, $14.95*

GAME PLAYING WITH BASIC (3 separate tapes) . . . Features educational and recreational programs. Separate book covers all 3 tapes, *#5109-3, $7.95. Tape 1, #00201; Tape 2, #00301; and Tape 3, #00401, $9.95 each*

GENERAL MATHEMATICS — 1 . . . Provides 15 programs useful to anyone who wishes to improve their math skills and accelerate their computations. FDI. *#01101, $14.95*

MAYDAY . . . An exciting and fast-moving airplane flight simulation. It takes concentration, judgment, and agility to avoid crashing! FDI. *#02601, $9.95*

See these and future tapes at your local computer store!

Or write to:

HAYDEN BOOK COMPANY, INC.
50 Essex Street, Rochelle Park, NJ 07662

Hayden PET Tapes make terrific holiday gifts!

0059-005D	89-93	Misc. numeric storage area
005E-0063	94-99	Accumulator #1: E,M,M,M,M,S
0064	100	Series evaluation constant pointer
0065	101	Accumulator hi-order propogation word
0066-006B	102-107	Accumulator #2
006C	108	Sign comparison, primary vs. secondary
006D	109	low-order rounding byte for Acc#1
006E-006F	110-111	Cassette buffer length/Series pointer
0070-0087	112-135	Subrtn: Get Basic Char; 77, 78 = pointer
0088-008C	136-140	RND storage and work area
008D-008F	141-143	Jiffy clock for TI and TI$
0090-0091	144-145	Hardware interrupt vector
0092-0093	146-147	Break interrupt vector
0094-0095	148-149	NMI interrupt vector
0096	150	Status word ST
0097	151	Which key depressed: 255 = no key
0098	152	Shift key: 1 if depressed
0099-009A	153-154	Correction clock
009B	155	Keyswitch PIA: STOP and RVS flags
009C	156	Timing constant buffer
009D	157	Load = 0, Verify = 1
009E	158	# characters in keyboard buffer
009F	159	Screen reverse flag
00A0	160	IEEE-488 mode
00A1	161	End-of-line-for-input pointer
00A3-00A4	163-164	Cursor log (row, column)
00A5	165	PBD image for tape I/O
00A6	166	Key image
00A7	167	0 = flashing cursor, else no cursor
00A8	168	Countdown for cursor timing
00A9	169	Character under cursor
00AA	170	Cursor blink flag
00AB	171	EOT bit received
00AC	172	Input from screen/input from keyboard
00AD	173	X save flag
00AE	174	How many open files
00AF	175	Input device, normally 0
00B0	176	Output CMD device, normally 3
00B1	177	Tape character parity
00B2	178	Byte received flag
00B4	180	Tape buffer character
00B5	181	Pointer in file name transfer
00B7	183	Serial bit count
00B9	185	Cycle counter
00BA	186	Countdown for tape write
00BB	187	Tape buffer #1 count
00BC	188	Tape buffer #2 count
00BD	189	Write leader count; Read pass 1/pass 2
00BE	190	Write new byte; Read error flag
00BF	191	Write start bit; Read bit seq error
00C0	192	Pass 1 error log pointer
00C1	193	Pass 2 error correction pointer
00C2	194	0 = Scan; 1-15 = Count; $40 = Load; $80 = End
00C3	195	Checksum
00C4-00C5	196-197	Pointer to screen line
00C6	198	Position of cursor on above line
00C7-00C8	199-200	Utility pointer: tape buffer, scrolling
00C9-00CA	201-202	Tape end address/end of current program
00CB-00CC	203-204	Tape timing constants
00CD	205	00 = direct cursor, else programmed cursor
00CE	206	Timer 1 enabled for tape read; 00 = disabled
00CF	207	EOT signal received from tape
00D0	208	Read character error
00D1	209	# characters in file name
00D2	210	Current logical file number
00D3	211	Current secondary addrs, or R/W command
00D4	212	Current device number
00D5	213	Line length (40 or 80) for screen
00D6-00D7	214-215	Start of tape buffer, address
00D8	216	Line where cursor lives
00D9	217	Last key input; buffer checksum; bit buffer
00DA-00DB	218-219	File name pointer
00DC	220	Number of keyboard INSERTs outstanding
00DD	221	Write shift word/Receive input character
00DE	222	# blocks remaining to write/read
00DF	223	Serial word buffer
00E0-00F8	224-248	Screen line table: hi order address & line wrap
00F9	249	Cassette #1 status switch
00FA	250	Cassette #2 status switch
00FB-00FC	251-252	Tape start address
0100-010A	256-266	Binary to ASCII conversion area
0100-013E	256-318	Tape read error log for correction
0100-01FF	256-511	Processor stack area
0200-0250	512-592	Basic input buffer
0251-025A	593-602	Logical file number table
025B-0264	603-612	Device number table
0265-026E	613-622	Secondary address, or R/W cmd, table
026F-0278	623-632	Keyboard input buffer
027A-0339	634-825	Tape #1 buffer
033A-03F9	826-1017	Tape #2 buffer
03FA-03FB	1018-1019	Vector for Machine Language Monitor
0400-7FFF	1024-32767	Available RAM including expansion
8000-8FFF	32768-36863	Video RAM
9000-BFFF	36864-49151	Available ROM expansion area
C000-E0F8	49152-57592	Microsoft Basic interpreter
E0F9-E7FF	57593-59391	Keyboard, Screen, Interrupt programs
E810-E813	59408-59411	PIA1 - Keyboard I/O
E820-E823	59424-59427	PIA2 - IEEE-488 I/O
E840-E84F	59456-59471	VIA - I/O and Timers
F000-FFFF	61440-65535	Reset, tape, diagnostic monitor

A Commodore Perspective

Commodore's new marketing moves (whether "reactive" or planned) are exciting old time PET owners and dealers alike. In example, their recent service seminars have been provided at no charge to dealers (with the exception of personal expenses) ... and Commodore is providing breakfast, lunch, materials & service manuals at *no cost!* A welcome start ... our plandits to whoever's responsible at Commodore. In this article, Bob Crowell provides an interesting overview/perspective.

Robert J. Crowell
President
New England Electronics Co., Inc.
679 Highland Avenue
Needham, MA 02194

The history of the Commodore PET computer is a very interesting and mostly unknown story. For the benefit of the vast group of Commodore PET owners, here is a brief history, from the author's experience, on the evolution of the Commodore PET.

The story of the Commodore PET computer began in 1974. MOS Technology, a semiconductor research and manufacturing company in Norristown, PA., was partially purchased by Commodore. This purchase gave Commodore a new technological 'pool' to draw from. In 1975, the founders of MOS Technology, some of whom were from the Motorola 6800 (microprocessor) design group, felt that they could improve on the 6800 microprocessor. The resultant research and development led to the announcement of a whole new series of integrated circuits, the 6500 series. The 6502 CPU "Computer on a chip" microprocessor and future CPU of the PET was born. The announcement of this family of chips did not arouse much excitement except in engineering circles. As the product data sheets on this new family of chips were circulated, engineers spent many hours discussing the future applications of the 6502 CPU, PIAs, VIAs, and other esoteric technological marvels.

At this time, during early 1976, the microcomputer industry consisted of a relatively small number of engineering type hobbyists happily assembling a few microcomputers (the first microcomputers were produced in kit form). Soon various articles began appearing that heralded the availability of microcomputers for everyone.

How many of these "computers on a board" would sell? No one at that time could estimate the market for a technologically new product like microcomputers. As advertisements on this new product continued circulating, the infant "hobbyist" market began clamoring for attention by ordering thousands of these units, mostly on a cash prepaid basis. Send in your funds and wait three to six months for your unit to arrive!

During this period the engineers at MOS Technology, having recently been acquainted with this new industry, announced that they would introduce a new computer on a board called the KIM-1. The KIM-1, with the 6502 as the CPU/brain, became a success before the first unit came off the assembly line. The 'father unit' of the PET was born.

Thousands upon thousands of KIM's were subsequently sold as the hobbyist, industrial, and educational markets adopted the KIM-1 with open arms. Remember, the KIM-1 was designed for easy use. All you had to do was hook up your own power supply, hook up a cassette, and away you went happily programming in hexadecimal format! Even at this early stage it was evident to some people that the KIM's days were numbered. Sooner or later the various markets demanding the KIM-1 would become semi-saturated.

During the introduction of the KIM, a vague shape began forming in the mind of a senior engineer at MOS. Why not design a KIM-like unit that would contain a power supply, an interpretive language (basic) to allow non-technical people to program it, a CRT video display, and a keyboard? Could a product like that be sold? Who would buy it? How would the unit be marketed?

As the KIM-1 enjoyed a vast amount of success, MOS Technology was selling integrated circuits for use in calculators and other products. (All you Apple owners can thank MOS Technology for the 6502 Microprocessor!) Enter Commodore in a big way! Commodore, a customer and partial stockholder of MOS, was one of the earliest manufacturers of handheld calculators. MOS Technology had the chip development and manufacturing capabilities to produce chips in large quantities but did not have a consumer-oritned marketing staff. Commodore did not have any large chip manufacturing capability but was essentially a marketing firm with offshore calculator manufacturing capabilities. The match was obvious and a very quick "takeover" was arranged. The result was that Commodore became a vertically integrated company, designing and manufacturing chips on one end and selling the finished product on the other end. This vertical integration, in conjunction with the overseas arms of Commodore, laid the foundation that allowed Commodore to announce that an entirely new product was coming. By December of 1976, Commodore's stock had jumped from 4½ to 7.

Who would buy the unit? At what price? What do we call it? As this new unit would probably be sold directly to users in the home, an acceptable name had to be created. Remember, in 1977, very few people had a firm understanding of this new market, and the general consensus was that the lion's share of the market would be people utilizing the unit for 'personal' transactions. Since computers were 'scary' to the average person (they fill entire rooms and cost millions of dollars, don't they?), a nice, comfortable product name had to be created. The name Personal Electronic Transactor was quite a mouthful, but as was originally planned, the acronym P.E.T. became the accepted name.

The original pricing of the unit was announced in mid-1977 at $495 for the 4K RAM unit. The price quickly went to $595 for the 4K unit and a $795 8K (optional) unit was announced.

The industry scoffed and said it couldn't be done at that price. Well, basic marketing philosophy (and good corporate management) dictates that if you come out at the lowest possible price point, with a good possibility of a mass market, you make small profits (if any) at the beginning, and you make it up in future large volume production. Of course, a low price also helps to preclude market entry from competitors. An ulterior pricing motive may have been to announce a price that would remain stable. In the mid 1970's the pricing in the calculator market continuously decreased as companies 'skimmed' the market with one lower price point after another. Due to these regular decreases in price, the purchasing public began waiting for lower prices before they purchased. If the PET was announced at a higher price, say at $1195 and then dropped to $995 and then again to $795 the market would possibly have waited for even lower price points. As the PET, by its very nature, would have a much longer product life cycle than a calculator product, a stable pricing policy became an important consideration.

In June of 1977, Commodore unveiled the PET at the Consumer Electronics Show in Chicago. There was the PET, amidst all the Commodore calculators. The public went wild. I personally stood there and like many others wrote out a check (at full retail) to Commodore to purchase a PET. I watched one person purchase four units. During the three-day Show, Commodore's stock again jumped, this time to 9¼.

Commodore originally announced that the PET was capable of handling many different tasks, especially with their "soon to be available" 2020 printer. Many of these potential uses would, of course, require a printer as well as support from Commodore. However, Commodore never had a chance. After Popular Science put the PET on it's cover the demand for the PET exploded. Commodore quoted 30-day delivery, then 60, then 90, then an astounding 4-5 months! Remember, these were all prepaid orders. Commodore was inundated with customer orders, dealer inquiries, and requests for information. Due to the size of Commodore's staff, many requests went unanswered, as Commodore concentrated on the task at hand — producing as many PETs as possible.

As Commodore was marketing the PET directly to consumers, the 40 to 50 dealer inquiries received per day piled up. A few persistent dealers continued to clamor for attention.

Due to the absolutely incredible demand for the PET, Commodore was extremely selective of it's dealers. Commodore required a service technician, a retail outlet, an excellent credit history, and a cash deposit on future orders. The cash deposit weeded out a large percentage of potential dealers and left Commodore with only financially strong dealers to choose from. A tremendous committment to the future of the PET and to Commodore was required for a prospective dealer to send a certified check for a large amount of money, with no idea when to expect their deposits back. The required cash deposit also supplied Commodore with short-term working capital, allowing them to maximize production. In early 1978, as demand continued to expand, the Commodore PET dealer network was started.

The dealers who were selected found themselves able to require prepayment from customers: in economic terms, a vertical transfer of funds. Commodore required deposit funds and in turn, the dealer required prepayment; delivery to customers (from dealers) was now 30-60 days. The purchasing public prepaid and prepaid. Commodore's stock rose and rose.

As volume production began in earnest, Commodore (I assume) realized that within a year or so PET production and therefore supply would be close to PET demand. Commodore had increased production, but had not increased their marketing staff to support the large numbers of PETs being delivered. As the PET is a computer, many user and dealer questions arose. Most of these questions went unanswered as the small marketing staff at Commodore was taxed to the limit. In order to expand the markets for the PET, a crash effort began to bring the long-awaited peripheral printer to market.

Problem after problem developed, vendor designs were examined, tested, and discarded one by one. A print head was finally accepted and Commodore announced that the long awaited printer would go into immediate production with deliveries commencing in a few months. After this public announcement, in January of 1978, Commodore found that the print head they had selected did not perform within the specified engineering parameters. The print head mechanism developed problems after continuous use. An increase in price was announced hoping (I assume) that the extra projected profits would justify a quick re-engineering of the unit. However, this was not to happen. The print head problem, coupled with other problems was enough to force Commodore to cancel the 2020 printer. Back to the drawing board. Within a few months, Commodore announced that they would come out with two new printers, at higher prices, at some point in the future.

Many customers had prepaid 2020 printer orders and the lack of information from Commodore on their orders, coupled with the lack of good documentation on the PET, strained customer and dealer relations. In the midst of all these problems, a larger problem arose. PET production was rising faster than PET demand and soon a production surplus would be created.

A major corporate decision was finally made to bring in some upper echelon personnel to assist Commodore in the transition from the marketing of the 8K PET to the marketing of the CBM business system (large keyboard PETs and peripherals). A secondary

SAWYER SOFTWARE

QUALITY BUSINESS SOFTWARE FOR THE COMMODORE PET tm

☆ACCOUNTING PACK I—
Accounting Pack 1 is a general ledger package designed for small businesses and homeowners. It contains check journal, general ledger, income statement (current ytd, previous month ytd and current month), balance sheet (current month and previous month). There are 15 commands and 6 reports that can be generated. The system uses an unique single-entry bookkeeping system and can hold up to 50 entries per period (month, week, day) and up to 40 different accounts. Each period's data is kept on convenient cassette tapes. Utilizing the general ledger command the user can view the general ledger entries for the month from Assets to Expenses or stop in midstream and view one particular account. Or the user can type in an account name such as "Advertising" and view the entries for that month. The Accounting Pack 1 program includes a checkbook reconcilation routine which aids in finding checkbook errors.
.... **$25.00**

"Accounting Pack I by SAWYER SOFTWARE can be described in one word: Fantastic. Any who has prepared a balance sheet manually will have a slight heart murmur upon using the Accounting Pack. It is amazing that the program fits in 8K. I would say the Accounting Pack is useful and could justify the price of a PET unto itself for any small business."
Review in BEST OF PET GAZETTE.

SCHEDULE PLANNER —
Schedule Planner can be used by secretaries, receptionists, housewives or anyone wanting to plan and have at their fingertips their own schedule. Data entered is data: time, priority and description. The commands allow the schedule to be shown for a particular day, request of time or the "viewing" of appointments according to importance.
.... **$15.00**

SCHEDULE PLANNER #2 —
Schedule Planner #2 includes all the features of Schedule Planner, but is used for one or more individuals. Utilizing Schedule Planner #2 a customer can call in asking when his appointment with Dr. Jones is and in seconds the receptionist can give the date and time. Or Dr. Jones can find out his schedule for the day. With the viewing command, an appointment at 12:00 on a particular day will display on the screen at that time allowing receptionists and secretaries to validate appointments.
.... **$20.00**

★★★ NEW ★★★

Business Software For Your Compu-Think Disk.

GENERAL LEDGER —
Maintains data files on disk. Prints standard reports - Balance Sheet, Income Statement with percentages and Trial Balance. Same General Ledger as we use to maintain our financial information.
.... **$195.00**

PAYROLL —
Computes FICA, Federal and State (calculated on percentage of gross pay and can be customized for your particular state). Prints individual employee records for quarterly reports. Up to 250 employees per disk.
.... **$195.00**

MAILING LIST —
Up to 1,000 names per diskette. Will print by key field, zip, state or code (you specify). Will interface to upcoming Accounts Receivable package.
.... **$195.00**

★★★ NEW ★★★

Business Software For Your Commodore Disk

GENERAL LEDGER —
Maintains data files on disk. Prints standard reports - Balance Sheet, Income Statement with percentages and Trial Balance. Will interface to upcoming AR and AP packages.
.... **$195.00**

PAYROLL —
Computer FICA, Federal and State (calculated on percentage of gross pay and can be customized for your particular state). Prints individual employee records for quarterly reports. Up to 250 employees per disk.
.... **$195.00**

Call or write for your free brochure and hard copy on all our PETtm cassette and disk software. Include device number on all printer software. All programs include documentation, are in BASIC and on cassette or Compu-Think disk. When ordering disk software specify single density or dual density and send Compu-Think disk serial number. Add $5.00 for disk software.

☆ACCOUNTING PACK II—
Accounting Pack II is a much more powerful version of Accounting Pack I. It has all the features of Accounting Pack I, plus up to 250 entries per period, MENU, Optional debit-credit of entries, easy addition or deletion of accounts, formatter for reports, intelligent report generator and single entry for sales transactions. Accounting Pack II requires at least 8K additional memory for your PET. OPTIONS: 1. Accounting Pack I to Accounting Pack II data file converter (free to previous owners of Accounting Pack I).

AP2 also utilizes a printer for hard copies of all reports.
.... **$45.00**

☆PAYROLL—
Especially designed with the small businessman in mind. Utilizing cassettes can record data for any number of employees (8 employees per cassette). Computes tax information and updates totals for quarterly and yearly reports. Employees can be salaried or hourly and pay periods can be either weekly, bi-weekly, semi-monthly or monthly.
.... **$30.00**

PAYROLL - 16K—
Same as Payroll, but utilizes 8K additional memory in PET. Handles any number of employees by holding 25 employees' information per cassette. Also has Menu.
.... **$45.00**

☆BUSINESS ANALYSIS—
Business Analysis allows management to have available to them information for financial planning decisions. Up to 4 years of balance sheet and income statement information can be entered with resultant analysis in the areas of liquidity, leverage, profitability and activity. The ratios generated for each year are the: current ratio, acid test, debt-nw, profit-nw, profit margin, sales-rec, sales-inv, sales-wc, with a brief explaination of each. The growth analysis gives the yearly growth in 5 areas and the average growth in 5 areas. Future growth analysis projects figures for the next year.
.... **$30.00**

BUSINESS GRAPHIC PACK 1 —
Business Graphic Pack 1 is a simple program to use, but professional in output. The graph includes title, labeling of axis, dual graphic ability, whether the data is in Mill's, 100's or 1000's, and an optional x-axis = date and labeling of the x-axis with month and year. Entry is as easy as typing the title, # of entries, the X,Y value (Jan. 15, 1978 would be entered as 115.78), entering if the x-axis = date, if the user wants crosshatching and then graphing. The program also includes Nth order and Geometric regression to give the user a formula for his set of data (if possible).
.... **$25.00**

Sawyer Software

201 Worley Road
Dexter, Mo. 63841
314-624-7611

Dealer inquires invited.

☆ Now Available for the 16K Level II TRS-80 tm

WE HONOR master charge THE INTERBANK CARD

VISA

☆PET is a trademark of Commodore Business Machines, Inc.

TRS-80 is a trademark of Radio Shack a Tandy Corp.

Isn't it about time the computer adapted to you?

Get a pen or pencil and print the letter Z in the box below.

Congratulations! You just found out how easy it is to enter hand printed characters into your PET™ computer with the **PrestoDigitizer**™ tablet from Innovision.

The **PrestoDigitizer**™ lets the PET™ learn to recognize your printing style. Once you "teach" the computer your handwriting, you can save your stroke set on tape for later use.

Our recognition software is so fast Zorro wouldn't be able to get ahead of it! Print a letter and - *Presto!* - it appears in a string variable, ready to print, display, or use in your programs (our learning and recognition algorithms *combined* take only about 2K bytes of RAM).

By now you have found that most nifty peripherals cost $500 and up. How's this for a refreshing change: The **PrestoDigitizer**™, completely assembled and tested, ready to plug right in to the PET™ user port, plus a cassette with complete startup software, and full documentation including detailed instructions for writing your own programs for this tablet - the whole works will cost you only $48.50 plus tax and shipping.

- - - - < $50 ? - - - -

That's right - less than $50 for a device that is so unique and useful we could easily charge more. At this price anyone - educators, business users, home hobbyists, anyone who uses a PET™, can now have the ability to communicate with the computer in a mode we all know - hand printing.

So let the computer adapt - after all *you* are the boss!

(PET™ is a trademark of Commodore Business Machines, Inc. **PrestoDigitizer**™ is a trademark of Innovision. Patent pending.)

ORDER FORM: SEND WITH CHECK OR MONEY ORDER TO
INNOVISION, P.O. BOX 1317, LOS ALTOS, CA 94022

- -

OK, Innovision - I'm ready to take control of my PET™.
Ship me _____ **PrestoDigitizer**™ tablet(s) at $48.50 each plus $1.50 for shipping and handling (California residents include 6.5% tax). I have enclosed a check or money order for U. S. $____________, so quickly ship my tablet(s) to:

Name: ______________________________

Address: ____________________________

City, State, ZIP: ______________________

EXCHANGING THE ROMS

It doesn't matter whether you remove all of the old ROMs then insert all the new ones, or replace them one at a time. Just be sure to save the old ROMs in the conductive medium that came with the new ones. They will be needed if something happens to the new ROMs. It may be necessary during the exchange to temporarily insert some ROMs in aluminum foil to protect them from static electricity.

The position of each integrated circuit on the PET circuit board is designated by a letter to identify the row, followed by a number to identify the column. The ROMs are located on row H, which is the third row from the front. The columns are numbered from 1 through 7 going from right to left as you face your PET. To determine which ROM to put in each location in row H, refer to Table 1. Notice the Table shows the locations numbered H1 through H7 going from right to left as in your PET. When you have finished installing your new ROMs, check to make sure the notched end on each is toward the front of the PET, and that each is in the correct socket.

CHECKING OUT THE NEW ROMS

While the PET is still open, push down any cable connector which may have been pulled up when opening the PET. Now plug the PET in and turn it on. If the READY message appears on the screen, you can close the PET and proceed with the checkout. If it doesn't come ready, recheck the ROMs to see that each is in the proper location, especially the ROM in location H7. If each was in the proper location, then you should remove and reinsert each ROM while checking to see if any pins were bent during the first insertion.

TABLE 1

	H7	H6	H5	H4	H3	H2	H1
Old 6316 ROMS	901447-08	901447-04	901447-02	901447-06	901447-05	901447-03	901447-09
Retrofit 6316 ROMS	901447-26	901447-23	901447-21	901447-25	901447-24	901447-22	901447-20
Old 6540 ROMS	6540-018	6540-014	6540-012	6540-016	6540-015	6540-013	6540-019 or 011
Retrofit 6540 ROMS	6540-026	6540-023	6540-021	6540-025	6540-024	6540-022	6540-020

Once your PET will reset properly, running some programs should verify that the ROMs have been inserted properly. If a program gives errors, that doesn't mean a ROM is in the wrong socket. Running programs does not prove conclusively that none of the ROMs have been damaged. A much better test for damage would be to run the Commodore's GRAPHIC ROM TEST program in the diagnostic kit for the new PETs.

If you have any problems that you can't solve, or would rather not perform the installation yourself, see your nearest PET dealer with a service department about having them do the installation. You might also find out if your local PET dealer has a copy of the GRAPHIC ROM TEST, if you don't have access to one otherwise.

FREE UP TO $170 IN MERCHANDISE
WITH THE PURCHASE OF ONE OF THE FOLLOWING PET-CBM ITEMS!!

ASK ABOUT EDUCATIONAL DISCOUNTS ON PET

PET SPECIALS

		FREE*
PET 16N 16K full size graphics keyboard	$ 995	**$130**
PET 16B 16K full size business keyboard	$ 995	**$130**
PET 32N 32K full size graphics keyboard	$1295	**$170**
PET 32B 32K full size business keyboard	$1295	**$170**
PET 8K 8K small keyboard, integral cassette	$ 795	**$100**
PET 2040 Dual Disk Drive — 343,000 bytes	$1295	**$170**
PET 2022 Tractor Feed Printer	$ 995	**$130**
PET 2023 Pressure Feed Printer	$ 849	**$110**
PET C2N External Cassette Deck	$ 95	**$ 12**

Axiom EX-801 PET Printer(with graphics)	$475.00
Axiom EX-820 PET Plotter	$790.00
Atari 400 and 800	Write for Price
IEEE - RS232 Printer Adaptor for PET	$ 79.50
BETSI PET to S-100 Interface & Motherboard	$119.00
PET Connectors-Parallel or IEEE	$ 1.95
Cassette Port	$ 1.45
Personal Information Management System—	$ 8.90
Protect-A-Pet dust cover	$ 9.50
Programmers Toolkit - PET ROM Utilities	$ 45.00
Microchess for PET *(Peter Jennings)*	$ 17.90
PET 4 Voice Music Board (MTUK-1002-2)	**$ 44.90**
Music Software (K-1002-3C) for PET	**$ 16.90**
CmC Word Processor program for PET	$ 25.00
Bridge Challenger program for PET	$ 13.45
Adventure 1 for 24K PET	$ 7.95
Adventure 2 for 24K PET	$ 7.95
Tunnel Vision/Kat & Mouse-maze - PET	$ 7.95
Graphics Utility Package for PET	$ 13.45
Stimulating Simulations-Book & PET tape	$ 13.45
Kite Fight - 2 player action game - PET	$ 7.95
Write for PET Software List	
Drive Test - machine language arcade game	$ 4.90

Word Processor for PET — Machine Language version.
Auto scroll, insert, delete, form letter append, etc.
8K Version $24.00 16K or 32K with disk $95.00
***Amount of Free Merchandise with Purchase of PET-CBM Item.**

WRITE FOR 6502 AND S-100 PRODUCT LIST

FREE! UP TO $170 IN MERCHANDISE

MINIMUM ORDER $10.00

KIM-1 $159(Add $30 for Power Supply) SYM-1	$222
BAS-1 Microsoft ROM Basic for SYM	$ 85
Memory Plus	$199
SYM Assembler in ROM	$ 85
SEA-16 New 16K Static RAM	$325
Seawell Motherboard-4K RAM	$139
KTM-2 Synertek Keyboard and Video Interface with Graphics	$290
RAM 16 4MHz 16K Static RAM	$270
2716 EPROM (5 volt)	$ 39
6550 RAM (for 8K PET)	$12.70
6502 Microprocessor Chip	$ 9.95
6522 VIA	$ 9.75
6520 PIA	$ 5.50

2114 L 450ns $5.70 24 @ $5.15 100 @ $4.45

Hands on Basic with a PET	$ 9.90
Programming the 6502 *(Zaks)*	$ 9.90
6502 Applications Book *(Zaks)*	$11.90
6500 Programming Manual *(MOS)*	$ 6.50
6500 Hardware Manual	$ 6.50
Programming a Microcomputer: 6502	$ 8.90
Basic for Home Computers	$ 5.90

SALE

3M "Scotch" 8" disks	**10/$31**
3M "Scotch" 5" diskettes	**10/$35**
Verbatim 5" diskettes	**10/$27**
Diskette Storage Pages	**each $.45**

(Write for quantity prices)

Cassettes *(all tapes guaranteed)* AGFA PE 611
Premium quality, high output lownoise in 5 screw housing with labels:
C-10 10/5.95 50/25.00 100/48.00
C-30 10/7.00 50/30.00 100/57.00

A B Computers

115 E. Stump Road
Montgomeryville, PA 18936
(215) 699-8386

SCREEN PRINT ROUTINE

From David Malmberg — Sphinx

General utility to print the screen using the new PET printers, and convert from a basic print format to the PET printer format — which are far from compatible.

This routine will handle upper and lower case, as well as graphics and reverse fields. It can be appended to a program as a subroutine or used as a stand alone routine.

Some of the options in the routine are as follows:

1. Enhanced printing is obtained when the entry point is line 63500 i.e., GOSUB63500 or RUN63500.
2. Normal printing is obtained when the entry point is 63510.
3. Number of copies is set by the variable NN in line 63510.
4. Number of blank lines between copies is given by the limit of the for loop in line 63580.
5. Graphic or lower case modes are automatically handled by PEEKING in LOC(59468) and formatting to the printer accordingly. Note!!! This routine assumes the new ROM. If the old ROM is used, switch the CHR$(17)'s and CHR$(145)'s in lines 63526-29.
6. The routine will print the entire screen or until it encounters a "READY." The variable JJ, specified in lines 63520 and 63570, controls the print line range, and could be specified by the calling program — especially if the purpose was to use the screen as a work area to convert between BASIC and PET printer formats.

A word of caution — the PET printer interprets a number of characters as special control characters.

```
63500 CC$ = CHR$(1)
63510 NN=1 :OPEN 1,4 :FOR II=1 TO NN
63520 JJ=0
63521 SL$="" :JJ=JJ + 1 : FOR KK=1 TO 40
63522 WW=0 :XX=PEEK(32767+KK+40*(JJ-1))
63523 IF XX=32 OR XX=96 THEN SL$=SL$ + CHR$(32) :GOTO 63558
63524 IF XX>127 THEN SL$=SL$ + CHR$(18)
63525 IF PEEK(59468)=12 THEN 63541
63526 IF XX>0 AND XX<27 THEN SL$=SL$ +CHR$(17)+CHR$(XX+64) :WW=1
63527 IF XX>128 AND XX<155 THEN SL$=SL$ + CHR$(17)+CHR$(XX-64) :WW=1
63528 IF XX>64 AND XX<91 THEN SL$=SL$ +CHR$(145)+CHR$(XX) :WW=1
63529 IF XX>192 AND XX<219 THEN SL$=SL$ +CHR$(145)+CHR$(XX-128) :WW=1
63530 IF WW=1 THEN 63549
63541 IF XX<32 THEN SL$=SL$+CHR$(XX+64) :GOTO63549
63542 IF XX>31 AND XX<64 THEN SL$=SL$+CHR$(XX) :GOTO63549
63543 IF XX>63 AND XX<96 THEN SL$=SL$+CHR$(XX+128) :GOTO63549
63544 IF XX>95 AND XX<128 THEN SL$=SL$+CHR$(XX+64) :GOTO63549
63545 IF XX> 127 AND XX<160 THEN SL$=SL$+CHR$(XX-64) :GOTO63549
63546 IF XX>159 AND XX<192 THEN SL$=SL$+CHR$(XX-128) :GOTO63549
63547 IF XX>191 AND XX<224 THEN SL$=SL$+CHR$(XX) :GOTO63549
63548 IF XX>223 THEN SL$=SL$+CHR$(XX-64)
63549 IF XX>127 THEN SL$=SL$+CHR$(146)
63558 NEXT KK
63559 IF LEFT$(SL$,6)="READY." THEN 63580
63560 PRINT#1,CC$;SL$
63570 IF JJ<25 THEN 63521
63580 FOR PP=1 TO 10 :PRINT#1 :NEXT PP
63590 NEXT II :CC$="" :CLOSE 1
```

PET Resources

A:

Abacus Software
P.O. Box 721
Grand Rapids, MI 49510

Addison Wesley Publishing
Reading, MA 01867

ADP Systems
95 West 100 South
Logan, UT 84321

Aladin Automation
3420 Kenyon St. #131
San Diego, CA 92110

Alcorn Data Services
P.O. Box 1535
Corinth, MS 38834

Apparat
P.O. Box 10324
Denver, CO 80210

Aresco
P.O. Box 1142
Columbia, MD 21044

Automated Simulations
P.O. Box 4232
Mountain View, CA 94022

Axeco Industries
13304 87 NE
Kirkland, WA 98033

Axiom Corp.
5932 San Fernando Rd.
Glendale, CA 91202

B:

Biosystems Research
P.O. Box 160272
Miami, FL 33116

C:

CAP Electronics
1884 Shulman Ave.
San Jose, CA 95124

Century Research & Mtg.
4815 W. 77th St.
Minneapolis, MN 55435

Channel Data
5960 Mandarin Ave.
Goleta, GA 93017

CGRS Microtech
P.O. Box 368
Southampton, PA 18966

CMS Software
5115 Menefee
Dallas, TX 75227

Commodore — USA
3330 Scott Blvd.
Santa Clara, CA 95050

Commodore — Canada
3370 Pharmacy Ave.
Agincourt, Ontario
Canada

Commodore — England
360 Euston Rd.
London, England
NW1 3BL

Competitive Software
21650 Maple Glen Dr.
Edwardsburg, MI 49112

Compuquote
6914 Berquist Ave.
Canoga Park, CA 91307

Compuscan
Box 861-A
Valley Forge, PA 19481

Computer Project
Peninsula School
Menlo Park, CA 94025

Computers One/#306 Kahala
4211 Waialae Ave.
Honolulu, HI 96816

Computer Tutor
317 Elm St.
Helena, ARK 72342

Computhink
3260 Alpine Rd. .
Menlo Park, CA 94025

Computing Teacher/Comp Cnt
Eastern Oregon State College
LaGrande, OR 97850

Concordia Designs
P.O. Box 219
Scarborough, Ontario
Canada M1R 5B7

Conley Graphics
211 Purdue Rd.
Kensington, CA 94708

Connecticut Microcomputer
150 Pocono Rd.
Brookfield, CT 06804

Cooper Computing
Box 16082
Clayton, MO 63105

Coyote Enterprises
Box 101
Coyote, CA 95013

Creative Computing
P.O. Box 789-M
Morristown, NJ 07960

Creative Software
P.O. Box 4030
Mountain View, CA 94040

Cursor
Box 550
Goleta, CA 93017

D:

Dads Reliable Software
1614 Norman Way
Madison, WI 53705

Datasoft Research
3360 Ley Dr. #816
Los Angeles, CA 90027

Dilithium Press
P.O. Box 92
Forest Grove, OR 97116

Distinctive Interiors
6278 SW 14 St.
Miami, FL 33144

D&R Creative Systems
P.O. Box 402
St. Clair Shores, MI 48080

Dr. Daley
425 Grove Ave.
Berrien Springs, MI 49103

E:

Eclectic Software
2830 Walnut Hill Ln.
Dallas, TX 75229

Excel Co.
P.O. Box 1147
El Cerrito, CA 94530

F:

Fantasy Games Software
P.O. Box 1683
Madison, WI 53701

Forethought Products
87070 Dukhobar Rd. #K
Eugene, OR 97402

G:

H. Geller Computer Sys.
P.O. Box 350
New York, NY 10040

GPA Electronics
906 Blair Ave.
Oakland, CA 94611

George Risk Industries
GRI Plaza
Kimball, NEB 69145

Dave Gomberg
7 Gateview Ct.
San Francisco, CA 94116

H:

Hayden Book Co.
50 Essex St.
Rochelle Park, NJ 07662

Don Henderson
9350 Bolsa Ave. #8
Westminster, CA 92683

David Howe
Box 28314
Sacramento, CA 95828

HUH Electronics
P.O. Box 259
Fairfax, CA 94930

I:

Innovison
P.O. Box 1317
Los Altos, CA 94022

Instant Software
Peterborough, NH 03458

International Technical Systems
P.O. Box 264
Woodbridge, VA 22194

J:

James Johnson
9304 Emery Grv. Rd.
Gaithersburg, MD 20760

K:

Don Ketchum
313 Van Ness Ave.
Upland, CA 94720

Kilobaud — Microcomputing
Peterborough, NH 03458

Brent Klinchurch
2744 Ashwood St.
Orange, CA 92665

Kvenich & Associates
151 Carlingview Dr. #5
Rexdale, Ontario
Canada M9W 5E7

M:

Mad Hatter Software
219 Washington Ave.
Chelsea, MA 02150

Matrix Magazine
1041 North Main Street
Ann Arbor, MI 48104

McGraw Hill Book Company
P.O. Box 446
Hightstown, NJ 08520

M&E Associates
10439 N. Stelling Rd.
Cupertino, CA 95014

Micro
8 Fourth Lane
So. Chelmsford, MA 01824

Microphys Programs
2048 Ford St.
Brooklyn, NY 11229

Microsoft
300 San Mateo NE
Albuquerque, NM 87108

Microsoftware Systems
P.O. Box 1442
Woodbridge, VA 22193

Microtechnology Unlimited
P.O. Box 4596
Manchester, NH 03108

Microtronics
5943 Pioneer Road
Hughson, CA 95326

Minds Eye Personal Software
P.O. Box 354
Palo Alto, CA 94301

C.W. Moser
3239 Linda Drive
Winston-Salem, NC 27106

N:

Nestar Systems
810 Garland Drive
Palo Alto, CA 94303

O:

On Computing
70 Main Street
Peterborough, NH 03301

On-Line
24695 Santa Cruz Hwy.
Los Gatos, CA 95030

Osborne & Associates
P.O. Box 2036
Berkeley, CA 94702

If you're thinking of buying the *6502 Programming Manual*, which is the definitive book on machine language, remember that the identical book is published by Commodore, by Synertek, and by Rockwell. Shop around: Commodore's price is higher than the other two.

The book is a reference, not a teaching book, and it has muddy spots, but it's complete and accurate. Anyone trying to tackle machine language should have one.

To find out if you have anything on cassette tape: mount the tape on cassette player #1, press PLAY and then hold down the less-than (<) key. You'll see instantly if the tape is empty or not. Works on both old and new PETS.

Received a hot flash from the Vancouver group, but it may require a little more work ...

You can speed up the PET dramatically just by typing POKE 59458,62.

Problems to be investigated:

Doesn't seem to work on units with the old 011 ROM. Why?

On other machines, there might be a danger of crashing very occasionally — it hasn't happened to me, but it seems possible when I study the system. If so, the fix is very easy; use:

```
POKE 59458,62: POKE 59456,223
```

which is 100% safe. Question: is this too cautious? Will the single POKE work every time? Experiment! Supply feedback!

Jim Butterfield

REVIEW
NEW-CURSOR
$4.95
INTERNATIONAL TECHNICAL SYSTEMS, INC.
P.O. Box 264
Woodbridge, VA 22194

NEW-CURSOR is a momentary switch and resistor device which is designed to attach easily to your PET and give you the capability of a semi-warm reset. If you lose your cursor, a simple press on your NEW-CURSOR button will cause PET to reset without the shock to your power supply and video system such as you get when you turn your PET off and then on again.

The instructions provided are brief but clear. No soldering is required and the only tool needed is a screwdriver to open your PET. It took me (all thumbs) less than ten minutes to install my NEW-CURSOR which I received within a week of my order.

SURPRISE BONUS — I found that when I use NEW-CURSOR, I do not lose information stored in the 2nd cassette buffer!

This item is a MUST for anyone doing machine-language programming.

by Dr. Matarella

P:

People Computer Company
1263 El Camino Real - Box E
Menlo Park, CA 94025

Personal Computing
1050 Commonwealth Ave.
Boston, MA 02215

Personal Software
592 Weddell Drive
Sunnyvale, CA 94086

Pickles & Trout
P.O. Box 1206
Goleta, CA 93017

Pleiades Game Company
202 Faro Avenue
Davis, CA 95616

Program Design Inc.
11 Idar Court-Dept. 110
Greenwich, CT 06830

Programma International
3400 Wilshire Blvd.
Los Angeles, CA 90010

PS Software House
P.O. Box 966
Mishawaka, IN 46544

Purser Computer Cassettes
P.O. Box 466
Eldorado, CA 95623

Q:

Quill Software
2512 Roblar Lane
Santa Clara, CA 95051

R:

Recreational Computing
1263 El Camino Real-Bx E
Menlo Park, CA 94025

Reigh Engineering
635 Giannini Drive
Santa Clara, CA 95051

Mike Richter
2600 Colby Avenue
Los Angeles, CA 90064

S:

Harry Saal
810 Garland Avenue
Palo Alto, CA 94303

Sawyer Software
201 Worley Rd.
Dexter, MO 63841

Steve Shaw
P.O. Box 1707
Tampa, FL 33601

Skyles Electric Works
599 N. Mathilda Ave. #26
Sunnyvale, CA 94086

Softape
10756 Vanowen
North Hollywood, CA 91605

Softbrew
6206 Newberry Rd. #318
Indianapolis, IN 46256

Softone
315 Dominion Drive
Newport News, VA 23602

Softouch
Box 422
Logan, UT 84321

Softside Software
305 Riverside Drive
New York, NY 10025

Software Shoppe
P.O. Box 271 Dept. G
Berwyn, IL 60402

Software Industries
902 Pinecrest
Richardson, TX 75080

Speakeasy Software
Box 1220
Kemptville, Ontario
Canada

SSI
4327 East Grove St.
Phoenix, AZ 85040

Warren Swan
15933 S. Gove Ave.
Oak Forest, IL 60452

Sybex
2020 Milvia St.
Berkley, CA 94704

Small System Services, Inc.
900-902 Spring Garden St.
Greensboro, NC 27403

T:

Tab Books
P.O. Box 40
Blue Ridge Summit, PA 17214

Technical Hardware, Inc.
P.O. Box 3609
Fullerton, CA 92634

3G Company
Rt. 3 - Box 28A
Gaston, OR 97119

TNW Corporation
4805 Mercury St.
San Diego, CA 92111

Total Information Services
P.O. Box 921
Los Alamos, NM 87544

Tycom
68 Velma Ave.
Pittsfield, MA 01201

W:

Roger Walton
Box 503
Bethany, OK 73008

X:

X&Y Enterprises
P.O. Box 796
Huntsville, AL 35804

Z:

Zephyr Software
P.O. Box 713
Boneta, CA 92002

ZZYP Data Processing
2313 Morningside
Bryan, TX 77801

DUNJONQUEST™ Presents

THE TEMPLE OF APSHAI!
VISIT THE VAULT OF THE DEAD!

The Vault of the Dead is but one of the many dark and fearsome mysteries within the ruined Temple of Apshai. **The Temple of Apshai** is your first adventure in the DUNJONQUEST™ series of fantasy role playing games. DUNJONQUEST™ is a complete game system and **The Temple of Apshai** is a complete fantasy adventure game for you and your microcomputer.

- Take your favorite character—or let the computer create one for you!
- Let the Book of Lore guide you through a DUNJONQUEST™ within the Temple.
- Decide to fight the monsters or grab the treasure and run—but don't think too long—they'll come after you!

OVER 200 ROOMS!
OVER 30 MONSTERS!
OVER 70 TREASURES!

The Temple of Apshai—for the TRS-80 (Level II, 16K) and PET (32K) microcomputers.

Ask your local dealer
or send a check for $24.95 to:

Automated Simulations— Department J, P.O. Box 4232,
Mountain View, CA 94040

California residents please add 6% sales tax.

CASSETTE FORMAT REVISITED

Pulse position modulation is used in the PET (cries of 'what's that?'). At regular intervals a byte marker pulse is written on the tape, followed by bit pulses, the elapsed time defining the '0' or '1.' This method has several advantages. Because the bit pulses are referenced to the byte marker, data is fairly immune to variations in tape speed. If 8 bits do not follow the marker, there has been an error.

Three time periods are defined: Long (L) = 336 ± 5uS (1.49kHz), Medium (M) = 256 ± 5uS (1.49kHz), Short (S) = 176 ± 5uS (2.84kHz), and these are used to define a Word Marker = LLMM, '1' = MMSS and '0' = SSMM, where LLMM means: long '1,' long '0,' medium '1,' med '0.' Now to words, ASCII 'A' = 01000001 which, when preceded by the word marker and terminated with odd parity gives

LLMMMMSSSSMMSSMMSSMMSSMM
SSMMMMSSSSMMMMSS

· mkr 1 0 0 0 0 0 1 0 1 · gives a character length of 8.96mS. Note 8 bits plus parity to accommodate graphics. Now since it is inefficient to start and stop the tape for each character, they are stored in memory (635-825 or 827-1017 for = 1 or = 2) until sufficient to make up a block of data. I will deal with programs later as they differ from data. Now since data blocks are 191 bytes each a further check is possible (long or short block error). Each block is written twice and if an error is found in the first block, the second is used. Only if the corresponding byte in both blocks is in error can we not recover data.

Now the crunch. The cassette motor takes time to run up to speed and the interblock gap is there to allow for this. If we try to read the tape while the motor is still accelerating, errors are likely to occur. If the first byte or two are not recognized, the block is discarded. Should this contain the mark for end-of-file (EOF) or end-of-tape (EOT) the PET would crash. Owing to a bug in the operating system the inter-block gap is too short ... It is relatively simple to turn the cassette motor on before the buffer is full and patches for this have been printed in IPUG circulars but most comprehensively in the TIS Workbooks.

Two more definitions: Block end marker = LL plus leader, Leader = over 50 cycles of shorts.

PROGRAM FILE	DATA FILE	HEADER & END FORMATS
Header 192 bytes	Header 192 bytes	Low Starting
Repeated header	Repeated header	High Address
Program (one	Data block 192 bytes	Low Ending
long block)	Repeated data block	High Address
Repeated prog.	Data block as reqd.	ASCII Up to
	Repeated as reqd.	Prog 16
End block		chars
	Data + spaces to end	
Repeated end.	Repeat above	ASCII
	End block	Sp Spaces
	Repeat end.	to 191

ALL BLOCK TYPES

Leader		First leader 2 secs approx.
Count	9 bytes	First pass $89,88,...81
Down		Second pass $09,08,...08
Type		
Data area		If data or header 191 bytes If program, length of program
Check-sum		Exclusive-OR checksum of above (hdr type)
Block end mkr		Block end marker, 1 cycle long
Leader		Approx 450 cycles of leader (0.16 secs)

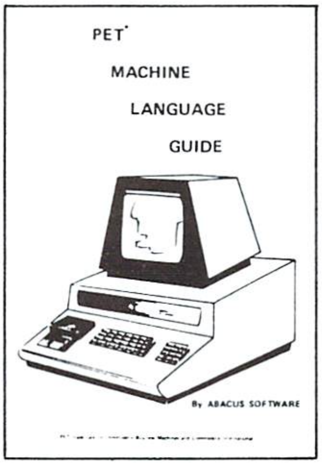
Reprinted by permission: Norman Basson, Independent PET Users Group of England

Elliam Associates (24000 Bessemer Street, Woodland Hills, CA 91367) offers cassette labels on pin-feed backing.

These white Cassette Labels are removable and come one label wide on fanfold, pinfeed backing.

Prices start at $5.90 per 100 and $27.00 per 500. Dealer and large quantity discounts are available.

PET' MACHINE LANGUAGE GUIDE



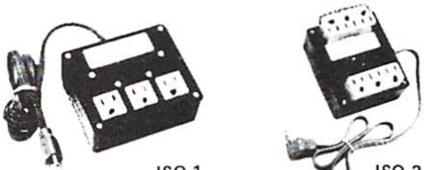
Contents include sections on:
- Input and output routines.
- Fixed point, floating point, and Ascii number conversion.
- Clocks and timers.
- Built-in arithmetic functions.
- Programming hints and suggestions.
- Many sample programs.

If you are interested in or are already into machine language programming on the PET, then this invaluable guide is for you. More than 30 of the PET's built-in routines are fully detailed so that the reader can immediately put them to good use.

Available for $6.95 + .75 postage. Michigan residents please include 4% state sales tax. VISA and Mastercharge cards accepted - give card number and expiration date. Quantity discounts are available.

ABACUS SOFTWARE
P. O. Box 7211
Grand Rapids, Michigan 49510

DISK DRIVE WOES? PRINTER INTERACTION?
MEMORY LOSS? ERRATIC OPERATION?
DON'T BLAME THE SOFTWARE!



Power Line Spikes, Surges & Hash could be the culprit! Floppies, printers, memory & processor often interact! Our unique ISOLATORS eliminate equipment interaction AND curb damaging Power Line Spikes, Surges and Hash.

*ISOLATOR (ISO-1A) 3 filter isolated 3-prong sockets; integral Surge/Spike Suppression; 1875 W Maximum load, 1 KW load any socket $54.95
*ISOLATOR (ISO-2) 2 filter isolated 3-prong socket banks; (6 sockets total); integral Spike/Surge Suppression; 1875 W Max load, 1 KW either bank $54.95
*SUPER ISOLATOR (ISO-3), similar to ISO-1A except double filtering & Suppression $79.95
*ISOLATOR (ISO-4), similar to ISO-1A except unit has 6 individually filtered sockets $93.95
*ISOLATOR (ISO-5), similar to ISO-2 except unit has 3 socket banks, 9 sockets total . . . $76.95
*CIRCUIT BREAKER, any model (add-CB) Add $ 6.00
*CKT BRKR/SWITCH/PILOT any model (-CBS) . . . . Add $11.00

PHONE ORDERS 1-617-655-1532

ESP Electronic Specialists, Inc.
171 South Main Street, Natick, Mass. 01760
Dept.pg

Dear Len,

I just finished reading the latest Gazette. You're getting better each time, and this one continues the trend. It brings up many points I'd like to discuss; as usual, you are free to publish any or all of this note.

First, on the subject of program protection, I agree with one of your correspondents in not promoting that protection. Recognize that I say that as one who has software on the market and hopes to make some money from it. But in the personal computer business, the general case of games and the like should not be to make a living at programming. First, any program produced on cassette can be duplicated; audio techniques will always work, and piracy is therefore always possible. More generally, if you had a perfect protection technique, you could not make the duplicates to distribute to exploit it! Thus, one depends on the honesty of the buyer and on reasonable pricing. That is, if someone makes a product which is worth the money (e.g., Microchess 2.0), the user will be willing to pay for it. On the other hand, if one is ripped off for $20 for software not worth $5, one gets mad. Therefore, it is necessary that the programs be priced in accordance with their worth. I have reviewed a lot of PET software recently, and have found none to be underpriced. I have found a lot to be overpriced, and would expect it to be stolen.

In reviewing the programs, I have come across several 'protected' against copying. Of course, they aren't safe from duplication, but they are difficult to change. So, when they are close to being right, or to being marketable, they are not worth the effort to fix. Better just reject them, and pass on the comments if you care to bother. But the main reason for not protecting code is to make it accessible to the user. The best computer game I've ever played is Thousand Miles by Frank Covitz. (It's for sale by Programma, but this is not a plug!) Even that program needed a few fixes (initialize the random number seed, poke 59468, improve the human interface) before it was put on the market. If he had protected the program, that would have been impractical. And, on my big PET, I want to add some graphics, improve the machine algorithm, etc. That exercise should be encouraged, not suppressed. For example, some of my simple games give the user directions for changes which may personalize the product. That matters to me, primarily to persuade the game player that he/she can be a game maker. My philosophy is known to you from HUNT, and I'm glad to say that the people at Programma have been happy to cooperate with me; none of my software will be guarded against user modification. Recognizing that that means possible loss of income to a young, struggling company, I am very appreciative of their attitude.

On to the disc question. Commodore seems to have solved the hardware problems; my discs are doing fine. File handling is excellent, although a bit tedious. The essence of the DOS isn't really here yet, although the version I have would be a good start if it didn't have a significant bug. I assume that the bug is either out by now or will be soon, and the new version should be workable. I am working on a very sophisticated library system now, which looks as though it will hold all of my 10,000 or so classical recordings on a single disc, with access by soloist, conductor, etc. So far so good, and I have all but one of the major software elements completed. (That one, to merge files, should be done this week.) They are trying at Commodore now, although they still aren't succeeding in supporting the customers very well. Surprise? Oh, come on now!

Sincerely,
Mike Richter

CGRS MICROTECH has announced a 6502 Professional Development System. Using the standard S100 microcomputer bus, the system features the CGRS 6502/S100 MPU Board. Additional boards in this multi-card computer consist of: the CGRS Multiple I/O Board, a S100 Disk Controller Board and a 16K RAM Board. All boards are mounted in a 10 slot S100 Mainframe leaving room for expansion and experimental hardware.

The CRS-DOS operating system and a disk operating package complete with Editor/Assembler are standard.

The 6502 PDS comes with dual minifloppy (5") or dual full size (8") floppy disks. The minifloppy system sells for $2500 and the full size floppy based system sells for $3300. Available options include a hardware DMA Front Debug Panel ($250), additional 16K RAM ($350), 9 digit Basic interpreter ($250), Pragmatic Designs DBM-1 ROM simulator ($270), and an internal Video Terminal ($650). A set of manuals is available separately for $25. For additional information, contact: CGRS Microtech, P.O. Box 368, Southampton, Pa. 18966 (215) 757-0284.

Review NEW-CURSOR
INTERNATIONAL TECHNICAL SYSTEMS,
Box 264
Woodbridge, VA 22194

Cursor, not to be confused with the cassette magazine of that name, is a reset button to clear a program or stop a crashed program without turning off the PET's power. This little $4.95 device consists of a pushbutton switch mounted with sticky tape and two jumpers with alligator clips — one grounded to a board mounting screw, the other going to a certain resistor on the board itself.

Installing cursor takes just a jiffy and it works exactly as advertised. One push of the button and you are back to the 'bytes free' message on the PET screen. Cursor is a worthwhile convenience and well-worth the price.

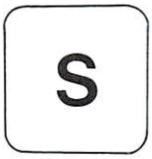
John Hirsch

Skyles Electric Works

You love your PET, but you'll love it more with this BigKeyboard?

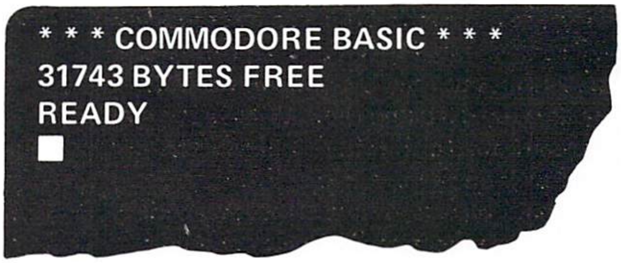
74KB Big KeyBoards @ $125.00 (Plus $5.00 shipping & handling)

The Skyles Big KeyBoard™. More than 15 inches wide. A layout nearly identical to the PET Keyboard and with *all* functions—alpha, numeric, graphics, special symbols, lower case alpha—on full-sized, almost plump, key-tops double-shot to guarantee lifetime durability.



Actual size

Would you like to turn on your PET . . . and see this



```
* * * COMMODORE BASIC * * *
31743 BYTES FREE
READY
■
```

8KB 8K Memory Expansion Systems @ $250.00
(Plus $3.50 shipping & handling)

16KB 16K Memory Expansion Systems @ $450.00
(Plus $5.00 shipping & handling)

24KB 24K Memory Expansion Systems @ $650.00
(Plus $5.00 shipping & handling)

Skyles Memory Expansion Systems are complete; nothing more to buy. • First quality static RAMs • Solid soldered on first quality glass epoxy board • Separate PET Adapter Printed Circuit Board connects directly to data bus on your PET—no rat's nest of hanging hand-wiring • Ribbon cable and 50 pin connectors that keep your PET open to the outside world (one on the 8KB; *two* on the 16KB and 24KB).

____ **8KB Memory Expansion System(s)** at $250 each. $______
(Adds 8,192 bytes; total 15,359)(*shipping and handling $3.50 each*)

____ **16KB Memory Expansion System(s)** at $450 each. $______
(Adds 16,384 bytes; total 23,551) (*shipping and handling $5.00 each*)

____ **24KB Memory Expansion System(s)** at $650 each. $______
(Adds 14,576 bytes; total 31,743) (*shipping and handling $7.00 each*)

____ **74KB Big KeyBoard(s)** at $125 $______
(*shipping and handling $5.00 each*)

____ **SPECIAL DEAL(S)**: 8KB Memory and 74KB KeyBoard at $350 complete $______

____ **SPECIAL DEAL(S)**: 16KB Memory and 74KB KeyBoard at $525 complete $______

* Please add 6% sales tax if you are a California resident; 6.5% if a resident of BART, Santa Clara or Santa Cruz Counties (CA). Please add shipping and handling costs as indicated..

VISA, MASTERCHARGE ORDERS CALL (800) 227-8398 (except California residents)
CALIFORNIA ORDERS PLEASE CALL (415) 494-1210

Skyles Electric Works
10301 Stonydale Drive
Cupertino, CA 95014
(408) 735-7891

Trace For The PET

Brett Butler
3017 Arvida Circle
Mississauga, Ontario
Canada L5N 1R6

I wished I had a TRACE program when I first got my PET. Eventually, I wrote it myself.

TRACE allows you to actually see Basic executing. It resides in the high end of memory, occupying less than 340 bytes.

It displays each line as it's inperpreted. This means that it shows the actual Basic commands being performed, rather than just listing the line. If part of a line is not executed, you won't see it. For example, if you have a conditional statement such as:

100 ON A GOTO 200,300,400 and variable
A is 2, you'll see: 100 ON A GOTO 200,300,

or with an IF statement like:

100 IF A > 5 THEN B = B + 2

with A less than 5 you'll see: 100 IF A > 5 THEN B
with A 5 or over you'll see: 100 IF A > 5 THEN B = B + 2

One more characteristic of TRACE: it also shows values that are being input.

TRACE comes as a Basic program, which POKEs the machine language instructions into the proper place. It finds the high end of memory, wherever it happens to be, and then builds the machine language up there. So it doesn't matter if your PET is fitted with 4K, 8K, 16K or more: TRACE will be packed into the right place.

```
1 PRINT"THIS PROGRAM LOCATES TRACE IN"
2 PRINT"ANY SIZE MEMORY THAT IS FITTED..."
3 PRINT"THIS VERSION WORKS ONLY WITH"
4 PRINT"ORIGINAL R O M PETS - USE ANOTHER"
5 PRINT"VERSION FOR THE NEW (16K,32K) MACHINES"
10 DATA-343,162,5,189,181,224,149, 194,202,16,248,169,239,133,210,96
11 DATA173,-343,133,134,173,-342,133, 135,169,255,133,124,160,0,162
12 DATA3,134,125,162,3,32,-272,208, 249,202,208,248,32,-272,32,-272
13 DATA76,106,197,162,5,189,-6,149, 194,202,16,248,169,242,133,210,96
14 DATA230,124,208,2,230,125,177,124, 96,230,201,208,2,230,202,96,32
15 DATA197,0,8,72,133,79,138,72,152, 72,166,137,165,136,197,77,208,4
16 DATA228,78,240,107,133,77,133,82, 134,78,134,83,173,4,2,208,14,169
17 DATA3,133,74,202,208,253,136,208, 250,198,74,16,246,32,-54,169,160
18 DATA160,80,153,255,127,136,208, 250,132,76,132,84,132,85,132,86,120
19 DATA248,160,15,6,82,38,83,162, 253,181,87,117,87,149,87,232,48,247
20 DATA136,16,238,216,88,162,2,169, 48,133,89,134,88,181,84,72,74,74
21 DATA74,74,32,-44,104,44,15,32, -44,166,88,202,16,233,32,-38,32,-38
22 DATA165,75,197,201,240,55,165, 79,208,4,133,77,240,47,16,42,201,255
23 DATA208,8,169,94,32,-30,24,144, 33,41,127,170,160,0,185,145,192,48
24 DATA3,200,208,248,200,202,16, 244,185,145,192,48,6,32,-32,200,208
25 DATA245,41,127,32,-32,165,201, 133,75,104,168,104,170,104,40,96,168
26 DATA173,64,232,41,32,208,249,152, 96,9,48,197,89,208,4,169,32,208
27 DATA2,198,89,41,63,9,128,132,81, 32,-54,164,76,153,0,128,192,79,208
28 DATA2,160,7,200,132,76,164,81,96, 76,-256,32,-263
1000 S2=PEEK(134)+PEEK(135)*256: S1=S2-343
1010 FOR J=S1 TO S2-1
1020 READ X:IF X>=0 GOTO 1050
1030 Y=X+S2:X=INT(Y/256):Z=Y-X*256
1040 POKE J,Z:J=J+1
1050 POKE J,X
1060 NEXT J
1070 PRINT" === TRACE ==="
1080 REM BY BRETT BUTLER, TORONTO
1090 PRINT"TO INITIALIZE AFTER LOAD: SYS";S1+17
1100 PRINT"TO ENABLE TRACE:        SYS";S1+56
1110 PRINT"TO DISABLE:      SYS"; S1+2
1120 PRINT"CHANGE SPEED WITH: POKE"; S1+124;",X"
1130 PRINT"==MAKE A NOTE OF ABOVE COMMANDS=="
1140 PRINT"SAVE USING MACHINE LANGUAGE MONITOR:"
1150 PRINT"   .S 01,TRACE";
1160 S=INT(S1/256):T=S1-S*256
1170 POKE 134,T:POKE 135,S
1180 POKE 130,T:POKE 131,S
1190 S=S1:GOSUB1400
1200 S=S2:GOSUB1400
1210 PRINT:END
1400 PRINT",";:S=S/4096
1410 GOSUB1420
1420 GOSUB1430
1430 T=INT(S):IF T>9 THEN T=T+7
1440 PRINT CHR$(T+48);: S=(S-INT(S))*16:RETURN
```

Programs may be changed, or new programs loaded, without affecting TRACE. It will stay in there until you cut power off. All Basic functions operate normally (but slower). If you use the STOP key to stop a program, hold it down for a few moments until it "catches."

There are two versions of TRACE: one for original ROM and one for the new upgrade (16K, 32K) ROM.

Once the machine language version of TRACE is written to fit your machine, it may be used right away or saved with the Machine Language Monitor ... Basic TRACE tells you how to do this. The machine language version is handier, since it will load more quickly — and it may be loaded without disturbing other Basic programs previously in memory.

There are four locations you need to know to run TRACE properly. The Basic TRACE loader gives you the addresses that apply to your machine.

INITIALIZE — seals TRACE into high memory and restores any existing Basic programs. Use once after loading the machine language TRACE.

ARM — sets TRACE on. From this point on, Basic programs can be TRACE'd

DISARM — sets TRACE off. TRACE remains locked in high memory, but does not act on your Basic program.

Speed Location — Poke any value from 1 to 255 here, to control the speed of the TRACE display.

The SYS commands for ARM and DISARM may be given directly from a program. So when you're debugging, you can have your program turn TRACE on at a certain point, and turn it off again later.

```
5 PRINT"THIS PROGRAM LOCATES TRACE IN"
6 PRINT"ANY SIZE MEMORY THAT IS FITTED..."
7 PRINT"THIS VERSION WORKS ONLY WITH"
8 PRINT"UPGRADE R O M (32K) PETS - USE
9 PRINT"ANOTHER VERSION FOR ORIGINAL R O M"
10 PRINT"MACHINES."
11 DATA -342,162,5,189,249,224,149, 112,202,16,248,169,239,133,128,96
12 DATA 173,-342,133,52,173,-341,133, 53,169,255,133,42,160,0,162,3
13 DATA 134,43,162,3,32,-271,208,249, 202,208,248,32,-271,32,-271,76
14 DATA 121,197,162,5,189,-6,149,112, 202,16,248,169,242,133,128,96
15 DATA 230,42,208,2,230,43,177,42, 96,230,119,208,2,230,120,96
16 DATA 32,115,0,8,72,133,195,138,72, 152,72,166,55,165,54,197
17 DATA 253,208,4,228,254,240,106, 133,253,133,35,134,254,134,36,165
18 DATA 152,208,14,169,3,133,107,202, 208,253,136,208,250,198,107,208
19 DATA 246,32,-54,169,160,160,80, 153,255,127,136,208,250,132,182,132
20 DATA 37,132,38,132,39,120,248,160, 15,6,35,38,36,162,253,181
21 DATA 40,117,40,149,40,232,48,247, 136,16,238,216,88,162,2,169
22 DATA 48,133,103,134,102,181,37,72, 74,74,74,74,32,-44,104,41
23 DATA 15,32,-44,166,102,202,16,233, 32,-38,32,-38,165,184,197,119
24 DATA 240,55,165,195,208,4,133,253, 240,47,16,42,201,255,208,8
25 DATA 169,105,32,-30,24,144,33,41, 127,170,160,0,185,145,192,48
26 DATA 3,200,208,248,200,202,16,244, 185,145,192,48,6,32,-32,200
27 DATA 208,245,41,127,32,-32,165, 119,133,184,104,168,104,170,104,40
28 DATA 96,168,173,64,232,41,32,208, 249,152,96,9,48,197,103,208
29 DATA 4,169,32,208,2,198,103,41,63, 9,128,132,106,32,-54,164,182
30 DATA 153,0,128,192,195,208,2,167, 7,200,132,182,164,106,96,76
31 DATA -255,32,-262
1000 S2=PEEK(52)+PEEK(53)*256: S1=S2-342
1010 FOR J=S1 TO S2-1
1020 READ X:IF X>=0 GOTO 1050
1030 Y=X+S2:X=INT(Y/256):Z=Y-X*256
1040 POKE J,Z:J=J+1
1050 POKE J,X
1060 NEXT J
1070 PRINT" === TRACE ==="
1080 REMARK: BY BRETT BUTLER, TORONTO
1090 PRINT"TO INITIALIZE AFTER LOAD: SYS";S1+17
1100 PRINT"TO ENABLE TRACE:        SYS";S1+56
1110 PRINT"TO DISABLE:      SYS";S1+2
1120 PRINT"CHANGE SPEED WITH:  POKE";S1+123;",X"
1130 PRINT"==MAKE A NOTE OF ABOVE COMMANDS=="
1140 PRINT"SAVE USING MACHINE LANGUAGE MONITOR:"
1150 PRINT"   .S ";
1160 S=INT(S1/256):T=S1-S*256
1170 POKE 52,T:POKE 53,S
1180 POKE 48,T:POKE 49,S
1190 PRINTCHR$(34);"TRACE";CHR$(34); ",01";
1200 S=S1:GOSUB1400
1210 S=S2:GOSUB1400
1220 PRINT:END
1400 PRINT",";:S=S/4096
1410 GOSUB1420
1420 GOSUB1430
1430 T=INT(S):IF T>9 THEN T=T+7
1440 PRINTCHR$(T+48);:S=(S-INT(S))*16 :RETURN
```

If you're tracing a dull part of your program, hold down the SHIFT key. This will speed things up a bit.

Special thanks to Jim Butterfield, Toronto; without his encouragement and assistance TRACE would still be just an idea.

32K Programs Arrive: Fantasy Role Playing Game For The PET

An overview by Len Lindsay

I am very pleased and impressed with the package I received from AUTOMATED SIMULATIONS, PO Box 4232, Mountain View, CA 94040. I refer to it as a package because it is more than a tape with a program on it. It is professionally packaged. The 60 page manual is typeset, well written and easy to understand. The tape has custom made cassette labels on each side and is in a norelco style hard plastic box. The manual and tape are sealed in a plastic "bag."

It takes about 10 minutes to load the program from tape into your PET. Once it is in you can SAVE it on disk if you have one. But the tape seems very reliable. It LOADED perfectly the first time. The program also relies on 4 DATA files on the back of the tape. I had no problem reading these files either. I should have a small program written for the next issue explaining how to read DATA from the tape and WRITE it onto your disk.

So, what is this program I am talking about, and WHAT DOES IT DO?!

The program is the first in a series of computer Role Playing Games (RPG). The series is called DUNJONQUEST (pronounced like dungeon quest). This first program in the series is titled TEMPLE OF APSHAI. The price is $24.95, a bargain for what you get.

What does it do? Automated Simulations explains it well in their brochure. "Explore the ruins of the ancient Temple of the god Apshai. Wrest golden treasures from the grasp of hideous monsters. Delve ever deeper into the forgotten labyrinth as you grow into a warrior of heroic powress!" The introduction in the manual is good at introducing a newcomer to Role Playing Games (RPG). Part of the introduction goes like this: "Role Playing Games (RPGs) allow you a chance to step outside a world grown too prosaic for magic and monsters, doomed cities and damsels in distress ... and enter instead a universe in which only quick wits, the strength of your sword arm, and a strangely carved talisman around your neck may be the only things separating you from a pharoah's treasure — or the mandibles of a giant mantis."

Role Playing Games try to simulate fantasy worlds as realistically as possible. This involves many details. Your character is identified by many qualities. How intelligent? How much intuition? How strong? How much dexterity? Etc. ... These qualities are used to determine outcomes of encounters, or what your character can and can't do. You receive silver pieces with which to buy swords, armor, etc. The computer does all the hard work of figuring out the details. It will tell you if your character is not strong enough to swing a Broadsword. You should get a smaller one. Buying the equipment is enjoyable in itself. You haggle with the Innkeeper over the prices. The computer plays the Innkeeper. It also uses the information about the qualities of your character to determine how good you are at bargaining.

This may sound very complicated, but I assure you it is NOT. Without a computer to help you it would indeed be extremely complex and require several people to play one game. But remember the PET is very capable and does all the complex duties for you. And no other players are needed. This is a solotaire game, the PET plays for everyone else. This game is for anyone who is tired of simple "video games."

There are over 200 rooms to roam about in. The PET displays a graphic display of your location on the screen along with a status summary. You do not just move from room to room. The rooms are BIG and you walk around in them, watch out for trap doors. You inspect the walls for secret doors. You have to open the door before you can go through it. It is important which way you are facing. You can walk up to 9 steps in the directions you are facing in one turn. Or you may use one of your turns to turn left.

This is a real time game. If you don't move, the monsters will. You can choose to talk to them (which is very risky), run away (if you can make it) or attack them. Several methods of attack are available. You may also have a bow and some arrows (maybe even magic arrows). It is safest to shoot at monsters from far away since they then can not strike back. Your arrow shots are visually animated on the screen as are your sword swings.

There is one important distinction about RPGs. When the game is over, if you survived, your character still lives on. He is richer, stronger, and has more experience. The extra money can be used to buy better armor. And his experience is one of the factors that the PET uses to determine outcomes of battles. The more experience, the better fighter you are. You can leave the game anytime you like. The PET gives you a summary of your character and his treasures and armor. You simply jot this information down. Next time you play, the PET asks you if you would like a new character created — say no, and then simply enter your data on the character you already have. You will get to know your "alter ego" very well, and begin to identify with him. You will learn that he is not very good at shooting arrows, but can run well. Best of all, you can take your character to other role playing games, either manual ones or the computer controlled games soon to be released.

DUNJONQUEST is quite an experience. I am very pleased with it and rate it as one of my favorite PET programs. A word of caution though. This is a serious game. Be prepared to THINK. Be ready to alter your strategy when it backfires. Oh, and you might be happy to know, that if your character dies, there is a good chance that the wizard will find and resurrect him (for a fee of course). But then again, his body and soul might get devoured by a monster first. You must see for yourself. Happy Gaming!!

Review

THE BASIC SWITCH

Model 15-A $99.95
$149.95 with BASIC Programmer's Toolkit

Small System Services, Inc.
900 Spring Garden St.
Greensboro, NC 27403

Like many early purchasers of the Commodore PET, I looked forward to the introduction of the normal sized keyboard 16 and 32K models. When one arrived locally, the first entry I made was a SYS(64824) call which on the old PET's initializes the operating system and prints out the free memory. I was surprised when this crashed the system. After recovering by turning the 16K PET off and on, I PEEKed location 135 and found that this location couldn't possibly contain the upper limit of memory (for a 16K PET this should be 64 and it was something like 255). Then I looked at the manual and discovered that a drastic revision of key memory locations occurred in the process of getting the "bugs" out of the old operating system. In as much as many programs I had developed since 1976 depend on calls to the operating system, I was upset to say the least.

As I'm sure is the case with many, I have learned to live with the bugs in the original PET BASIC and have developed many programs within its not too serious limitations. While most simple — all BASIC — programs will run on either version of the PET, many assembly language programs will run into trouble (for example, unused page 0 locations on the old PETs may be used on the new ones and using these locations for temporary storage can bomb the system). The only near saving grace was that the manual accompanying the new PETs did have a reasonable memory map (it took a year and six months to get the equivalent from Commodore for my old PET but fortunately other owners beat that record) so there was hope of revising my operating system software to be compatible with the new machines. But could I count on new software to be compatible with my old PET? Should I order the new ROM's and take advantage of the fixed bugs and the ROM monitor? But then my high memory monitor (which includes a dissassembler) wouldn't work. Would new peripherals from Commodore (especially IEEE ones) work with the old ROM's? I soon found my word processing program would not work with the new ROM. These were some of the many questions that crossed my mind. The BASIC SWITCH is the solution for being able to use either the old or new ROM's without having to do any more than throw a switch. The change can be made without turning off the PET and the system is re-initialized by the process, i.e. "### COMMODORE BASIC ###" or "*** COMMODORE BASIC ***" and "XXXX BYTES FREE" are printed out depending on which set of ROM's you have just switched in. This device does not tie up any of the ports so if you have peripherals like the CGRS PEDISK or the BETSI, you can still use them. As an added extra, the SWITCH has an empty socket for EPROM. I have seen the SWITCH in operation with a BASIC PROGRAMMERS TOOL KIT (Palo Alto IC's, A Division of Nestar Systems, Inc.). The empty socket is a zero force insertion socket so other ROM's can easily be substituted (finally the flexibility of a plug in ROM!). Although the Tool Kit has been reviewed elsewhere, I can add my enthusiasm for this product after having seen it in action. The 15th ROM socket can be readdressed in the area reserved for ROM expansion in the old PET's (starting at $B000) in order to avoid conflict with other additional ROM's (for example the DOS boot in ROM for the CGRS PEDISK is addressed starting at $B000).

In summary, the BASIC SWITCH offers old PET owners the advantages of the new ROM's while at the same time avoiding the time consuming process of rewriting existing operating system dependent software. As an added bonus, ROM-packs like the BASIC Programmer's Tool Kit (and hopefully others in the future) can be used.

Dr. J.A. Dilts
Department of Chemistry
University of North Carolina at Greensboro
Greensboro, NC 27412

Instant Software, Inc. of Peterborough, NH, has released its catalog of over 300 programs for the fall of 1979.

For a copy, inquire at your local computer store, or write: Instant Software, Inc., Catalog Dept., Peterborough, NH 03458.

The North London Hobby Computer Club, (Holloway, London N78DB) entering its second year, is now a recognised "course" within the Polytechnic of North London. Called Recreational Computing, it entitles all of its members to the benefits of being a part-time student. Contact them for more information.

P.S. Software House

THE LATEST ADDITION TO OUR SOFTWARE LIBRARY

THE MACHINE LANGUAGE UTILITY PAC

8 PROGRAMS IN ONE

- COMPLETE EXTENDED MONITOR
- DISASSEMBLER
- TAPE RELOCATE
- SCREEN PRINT PROGRAM
- RELOCATE
- HEX TO DECIMAL & DECIMAL TO HEX CONVERSION
- BASIC RENUMBER
- BASIC MERGE

PROGRAM SELF RELOCATABLE

A REAL WORK HORSE FOR THE MACHINE LANGUAGE PROGRAMMER

ONLY $29.95

(219) 255-3408
Dealer inquiries welcome.

P.S. Software House
Marketing and Research Co.
P.O. Box 966
Mishawaka, IN 46544

STOCK MARKET • TRADER ENTREPRENEUR

OPTION ANALYSIS SYSTEM

This system in strictly for the market speculator. Working with price, calculated volatility, and calculated average daily premium, this system picks the best buys from 75 or more options. Judgement by the analyst is required. For $35.00 you receive two programs plus example data base and instruction manual. TRS 80 LEVEL II and PET

STOCK MARKET ANALYSIS SYSTEM

Technical analysis, 12 daily and 15 weekly indicators, for the stock market enthusiast. This system signaled the Oct. 78 debacle. For $25.00 you receive two programs plus data base and 27 page detailed instruction manual.
TRS 80 LEVEL I or II 16K and PET

FINANCIAL ANALYSIS SYSTEM

Includes two programs and hard copy instructions for better control of your stock and option transaction. For $20.00 you receive software with eight analysis routines. Two of these routines are stock transactions which made money and option transactions which made money. Six more program routines exist with some consideration given to taxes. Please indicate:
TRS 80 LEVEL II 16K or PET 8K

ACCOUNTING ANALYSIS SYSTEM

Includes two programs and hard copy instructions for a small cash enterprise. From your data base a Profit and Loss Statement as well as a Balance Sheet are produced. In addition simple budget comparisons are made. Please remit $20.00 and indicate:
TRS 80 LEVEL II 16K or PET 8K

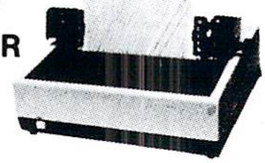
LETTER PROCESSER

This program for TRS 80 owners with printers. Generates letters to different individuals with the same body. Cassette file stores names and addresses. Remit $15.00.

Distributed by : STEVEN E. SHAW P.E.
P.O. Box 1707
Tampa, Florida 33601

THE BRAND NEW EXCEL TX-80 DOT MATRIX PRINTER

ONLY $560.00



STANDARD FEATURES:

- 80 columns on plain paper with adjustable paper width
- 150 characters per second (70 lines per minute) throughput;
- Friction feed standard, tractor feed at $25 more
- 96 character set (upper and lower case) plus PET's* graphic set
- Elongated character (double width printing)
- Microprocessor control and self-test when power up
- Centronics compatible parallel interface
- 90 days warranty parts and labor

OPTIONAL INTERFACE BOARDS & CABLE SETS:

- PET*, APPLE II*, TRS-80* and serial interface board available at $60 each
- All our interface boards reside inside the printer and does not require extra power supply
- Cable for each interface is available at extra cost

SEND ORDERS TO:
P. O. Box 1147
El Cerrito, Calif. 94530
Phone: (415) 465-4240

TERMS:
• Checks, Master Charge and Visa accepted • Allow up to 4 weeks for delivery • Please add $15 per printer for shipping & handling • Calif. residents add 6% sales tax.

EXCEL COMPANY
MICRO COMPUTER SYSTEMS
618 GRAND AVENUE
OAKLAND, CALIF. 94610

We are the original PET* Keyboard Interface people

***Trade Marks of Commodore, Apple & Tandy Corp.**

Non-Stop PETS, Old And New

Contributed by Micro Software Systems

This note provides a method for disabling the STOP key on either old (2001-4, 2001-8) or new (2001-16, 2001-32) PETs with a single algorithm, even though the locations and contents to be POKED are different. It is based on Len Lindsay's PET-POURRI column in the July 1979 issue of Kilobaud Microcomputing, but provides a correction and avoids a potential problem in the procedure he presented.

In PETs using Version 1 ROMs (models 2001-4 and 2001-8 which have not been modified), the STOP key is disabled with

```
10 POKE 537,136
```

and re-enabled with

```
20 POKE 537,133
```

PETs equipped with Version 2 ROMs (2001-16, 2001-32, and modified 2001-4 and 2001-8) may use the following to disable the STOP.

```
10 POKE 144,49
```

To re-enable the STOP,

```
20 POKE 144,46
```

A composite procedure, which will work on either machine, is based on the contents of memory location (50003) ... a fact which was brought to my attention by Ted Polczynski, attributed again to Len Lindsay. In the old ROM, PEEK (50003) gives a value of 0, while the new ROM returns a value of 1. The following BASIC program segment uses that value to adjust a POKE command for the machine it's running on.

To disable the STOP, use

```
10 PT = PEEK (50003): SL = 537-393*PT: DL = 136-87*PT: POKE SL, DL
```

To re-enable the STOP, use

```
20 PT = PEEK (5003): SL = 537-393*PT: DL = 133-87*PT: POKE SL, DL
```

The advantage of this version of the routine is that it always pokes the same value into the control location, no matter how many times the program is run.

Versions of the form

```
POKE SL, PEEK (SL) + 3
```

can cause unpredicted results (including loss of control) if they are executed more than once.

Julian Allason, of Petsoft, is interested in acquiring European rights for programs for PET, TRS 80 and Apple personal computers. For more information, write him at: Applied Computer Techniques Limited, Petsoft Division, 5/6 Vicarage Road, Edgbaston, Birmingham B15 3ES

A new catalog listing books, software and merchandise from Creative Computing (P.O. Box 789-M, Morristown, NJ 07960) can be obtained by calling toll-free 800-631-8112.

Un-Crashing On Upgrade ROM Computers

Jim Butterfield, Toronto

If you do much work in machine language, sooner or later you'll write a program that will crash.

Formerly, you were out of luck. Unless you were lucky enough to stumble into a type 1 crash — which would take you to the Machine Language Monitor, or to an ?INVALID NUMERIC statement — your only remedy would be to reset, and wipe memory.

Type 2 crashes (tight loops) could be guarded against with a little preparation involving fiddling with the interrupt structure. But the nasty type 3 crash (X2 codes) cannot be fixed without kicking the Reset line; and Reset means memory test, and memory test means you'll have to reload your program.

No more. On upgrade ROMs, you can come out of a hard crash with memory preserved.

Method: Set the diagnostic sense pin to ground; then kick the Reset line. The processor will re-awaken in the Machine Language Monitor with memory preserved.

There's more: you're not yet out of the woods. Type a semicolon followed by RETURN; PET will respond with a question mark. Now move the cursor back to your register display line, and change the Stack Pointer (SP) value from 01 to F8. This strange procedure is important: you must follow it exactly. Once you've done so, you're clear. You may return to Basic with an X if you like, or proceed in the MLM.

Hardware: To make the diagnostic sense pin: take a standard 12-pin edge connector and wire pin 5 (diagnostic sense) to pin N (ground). Key the connector so it sits on the parallel user port. Plug it in whenever you want to un-crash, but don't leave it on the machine.

The Reset button is a little trickier, since you have to know where to connect it. Check with someone who's knowledgeable on PET hardware.

Commercial sources: International Technical Systems. Box 264, Woodbridge VA 22194 makes a Reset button.

Gord Reithmeier, 411 Duplex Avenue, Apt. 11, Toronto Canada M4R 1V2, makes two uncrashing devices, either of which fits on the Parallel User Port; they include a diagnostic pin toggle switch and a Reset button. An IC clip snakes inside PET's cover to connect to the reset line. Instructions are included. The basic unit sells for $20; or for $30 the unit also includes the Poor Man's D/A converter.

Song data and sequencing data which are compatible with the MTU music software for PET computers are available from F. Covitz, Deer Hill Rd., Lebanon, N.J. 08833. Price is $1.00 per page. Write him for a list of current offerings.

Review

8-BIT DIGITAL TO ANALOG CONVERTER

Micro Technology Unlimited — $50

Review by Arthur Hunkins

Micro Technology Unlimited has produced an excellent DAC board for advanced home music applications. It contains an on-board filter and audio amplifier, and extends its connectors (user and cassette ports) to fingers on the opposite side, an important advantage for new PET's. It additionally provides a CB2 input to the audio amplifier section, bypassing the filter, and facilitating the board's use in simple, traditional musical applications.

Technical specifications and overall design are superior. The unit comes with a good manual that includes schematic, board layout, parts list, principles of operation, troubleshooting guide, and a modest amount of installation and test information. One problem: only a two-line program is given to verify correct operation of all sections, a program that, if successful, produces the sound of a "misfiring race car!" No other user software is included, only the suggestion that you purchase the K-1002-2 Advanced Music Software package for $20. (This advanced software package, which will be the subject of a January review, is entirely in machine language, and like many sophisticated programs, will not yet work on the new PET's. It does demonstrate, the capability of producing four-part harmony, each part with a unique tone color.)

For any musical application short of a stand-alone composition, use of the HUH Petunia software is recommended. It runs without modification on MTU's D/A converter. The Petunia software is a straightforward PET adaptation of one of Hal Chamberlin's Sept. 1977 Byte magazine programs. (This important article of Chamberlin's, "A Sampling of Techniques for Computer Performance of Music," reprinted in the *Byte Book of Computer Music*, is the source for 6502 microprocessor musical applications, including HUH software and hardware, and the various products MTU is marketing for the Kim and PET. Of course, Hal Chamberlin is Mr. Music at Micro Technology.)

The Petunia software (also in machine language though loaded by BASIC) can be easily modified to fit in the upper .5K of user memory, rather than 1K. Unfortunately, even this otherwise highly useful sound generating routine must be substantially modified to run on new PET's.

The MTU DAC is powered by the PET's own + 5 volts at the cassette port, a significant design feat for both filter and amplifier. It consumes little power (quiescent: less than 50ma; worst case drain: 300ma). The filter cuts off sharply at 3.5kHz, and is of a six-pole, .5db Chebyshev design. Power output is 300mw into an 8 ohm load (4-16 ohm permitted). The output features on-board trimpot and RCA phono jack. I use a modified ($6) Realistic Junction Box with two sets of headphones, switchable to a small speaker. The manufacturer

Micro Computer Industries, Ltd.

1532 East Mulberry Unit H
Ft. Collins, Colorado 80524
Phone 303 221-1955

CBM or PET Inventory Control

Cassette version, 8K PET **$39.95**

Disk version, 2500 items per drive with history and data base management. Writes purchase orders; sorts by 10 fields; no computer experience required. **$100.00**

Instructions $10.00 refundable with purchase

Complete system with 32K computer, 2040 disk drive, 2022 tractor printer with inventory control **$3,585.00**

• PET • PET • PET • PET • PET • PET • PET • PET • PET • PET • PET • PET • PET • PET

PET PRODUCTS

Programs — Workbooks
for Floppy Disk — for Cassette

TIS
See your Dealer
Dealer Inquiries Invited
Put your PET to work!

T I S

PROGRAMS

SW-1* **MAILB** mailing list system
SW-2* **CHECKBOOK** record
SW-3* **ACCOUNTS** keep track of who owes you how much
SW-4 **MEDIT** create and maintain data files
SW-5* **CALENDAR** appointments, meetings at a glance

WORKBOOKS		
WB-1	**Getting Started with Your PET**	$3 95
WB-2	**PET String and Array Handling**	$3 95
WB-3	**PET Graphics**	$4 95
WB-4	**PET Cassette I/O**	$4 95
WB-5	**Miscellaneous PET Features**	$3 95
WB-6	**PET Control and Logic**	$3 95

*These programs are special purpose data base management systems. They all can

- Sort numeric or string fields
- Select based on numeric or string (=)
- Select based on substring match
- Select based on range of entry number

Prices: $9.90 each for programs using cassette storage for data
$12.95 each using sequential floppy disk storage for data.
Price Includes 40 - 60 page Instruction manual

Add $2.00 for shipping and handling

Money back guarantee

TIS
P.O. Box 921, Dept. G
Los Alamos, NM 87544

VISA

On bank card orders, give all numbers

PET is a trademark of Commodore Business Machines

• PET • PET • PET • PET • PET • PET • PET • PET • PET • PET • PET • PET • PET • PET

suggests hookup to an external amplifier for uses requiring greater volume. One additional plus: jumper connections are readily accessible for obtaining at the output jack either the raw DAC, or unamplified filter signal.

Minor hardware disadvantages are as follows: 1) the connector finger extensions are not keyed (a hacksaw cures this problem fast), and 2) the cassette deck fingers are brought out on the *lower* side of the board. Since external cassettes use the *upper* connections, this is a notable inconvenience for those intending to use the board (eventually!) with the new PET's. However, a modest amount of rewiring (six jumpers) can dispose of this difficulty.

For anyone interested in more than one-voice music making with pulse waves, MTU's digital-to-analog converter is an excellent buy. If you don't happen to have the $50 this unit is well worth, there is another answer to "making chords," that is, if you don't care about filtering, but do like to put (very) simple circuits together, build Jim Butterfield's "Poor Man's D/A Converter" (PET Gazette, Spring 1979). I did — for $5 in parts on the back of a user port edge connector (the connector is half of the $5). It works quite satisfactorily, even without 1% resistors — using the Petunia software and external amplifier/speaker.

FOOTNOTE

Note/* for "CB2"

"CB2 sound" is a single pitch, 5-volt pulse wave available at the CB2 pin on the user port. To hear it without the MTU DAC, attach a live lead to the CB2 pin on the user port (see Commodore manual), and another to one of the ground connections on the same port. Do this through an edge connector. Attach the other ends to the line level (auxiliary) input of an amplifier/speaker. See also reference in this article to "Poor Man's D/A Convertor," which handles "CB2 sound."

Review
"BRIDGE CHALLENGER"

Author — George Duisman
Personal Software
P.O. Box 136-M
Cambridge, MA, 02138

"BRIDGE CHALLENGER" consists of 2 programs: BRIDGE deals hands randomly and defends against you, and DEALER is used to save special deals on cassette tape (BRIDGE will accept these tapes in lieu of the random hands). There is no bidding sequence; the human player simply selects the contract after viewing both the North and South hands. Hands may be replayed (good for trying alternate lines of play) and if you don't like the N-S hands you can request to play E-W (but then PET defends with the N-S hands, now labelled E-W).

The defense suffers from the absence of bidding cues, but it is no pushover. I tested it against defensive deals 41-46 in Alfred Sheinwold's A SHORT CUT TO WINNING BRIDGE (1961), and although I am far from an expert, I was able to make 4 of the 6 hands (2 with an over-trick) on my first try. Best defense sets all 6 contracts.

The program is in 'packed' BASIC, but is a tight fit in PET's 7167 bytes; I finally got tired of the OUT OF MEMORY ERROR message and deleted Line 3, a REM statement (Sorry, George!); it works fine now.

The program should be helpful to beginners who need experience as declarer, or to experienced players who want to try alternate lines of play. It has never failed to load, and there is reasonable documentation, neatly printed. It exists; it works; and I found it to be well worth the money.

Ken Morse

PET™ CURSOR
Programs for PET™ Computers

The Original Cassette Magazine for the Commodore **PET**.

- Five excellent programs come to you each month on a C-30 cassette, ready to load and run.
- Every issue has an animated "Front Cover" that uses **PET** graphics to the fullest.
- Compare value: each issue of CURSOR includes a featured program that would cost $7.95 to 12.95 elsewhere!
- CURSOR is mainly entertainment, but we also publish useful utility programs, as well as educational and business programs.
- With each monthly CURSOR cassette, you also receive CURSOR notes with written instructions for the programs, and a fresh, opinionated look at our crazy industry.

CURSOR = High Quality **PET** Software

☐ 12 issues only $33 in US & Canada
☐ 6 issues for $20 ☐ Sample Copy $3.95

We accept VISA and Mastercharge

Name ______
Address ______
City/State/Zip ______

CURSOR, Box 550, Goleta, CA 93017

Our Subscribers are Happy People!

DataSoft Research

PRESENTS....

* ASK FOR YOUR FREE BROCHURE TODAY! *

a Pet* software production

Your PET* needs us!

NEW

PROGRAM™ GENERATOR

PAD™ PROGRAM AIDED DISPLAY

NEW

™ SOFTFILE

PREVIEWS

PAD™	PROGRAM GENERATOR	SOFTFILE
Over a dozen functions to aid you in designing your output display! ■ Reduce programming time! ■ Create geometric shapes ■ Pattern designs ■ Graph & Chart displays ■ Gameboards (eg checkerboards) ■ Label & Title displays ■ Draw (horizontal, vertical & diagonal lines) ■ Erase ■ SAVE DISPLAY (for future use!) ■ and more . . .	TOP SECRET	LOADING
ADMISSION $19.50	ADMISSION $14.50	ADMISSION $14.50

See these NEW releases on a PET* near you!

PG | Pet Guidance suggested

DataSoft Research

the company that makes programming a little easier

3360 LEY DRIVE SUITE #816
LOS ANGELES, CALIFORNIA 90027

*PET is a Trademark of Commodore - Dealer Inquiries Invited -

PRINTED IN U.S.A

Using Direct Access Files With The Commodore 2040 Dual Drive Disk

Chuck Stuart, President
CMS Software Systems
5115 Menefee Drive
Dallas, TX 75227

One of the main advantages of using direct access files is the ability to access any record in a file directly without having to read through the entire file. With direct access, the last record in a file can be located and read into memory just as fast as the first record. Also, any record in a direct access file may be read into memory, updated, and then written back to the file without disturbing the other records in the file.

Although true direct access files are not directly supported in the current 2040 Disk Operating System, Commodore has provided a series of disk utility commands that will, in effect, allow direct access file processing. The difference being that instead of the DOS keeping up with the track and sector addresses of each record in the file, a separate sequential file must be maintained to hold the record keys and address pointers. If for instance, the direct access file is a Customer account file keyed by account number, then the sequential file would hold an account number for each record in the account file plus the track and sector addresses for each record. This sequential file must be loaded into an array in memory before any processing of the direct access file can take place. To access a specific account, the array must be searched for the desired account number and then the corresponding track and sector numbers are used to directly access the record.

If the 2040 supported true direct access file processing, it would only be necessary to indicate the account number in the INPUT# or PRINT# statement and the DOS would keep up with the track and sector addresses in it's own directory. Hopefully this will be implemented in a later version of the DOS.

It will probably be a little easier to understand and successfully use direct access files if you understand how a disk is laid out in tracks and sectors. Each disk has 35 tracks, each track is divided into from 16 to 20 sectors, and each sector holds 256 bytes of data. Each byte will hold one character. Since an entire sector is read from or written to the disk at a time, sectors are generally referred to as data blocks or simply 'blocks.' Tracks and sectors do not physically exist on the disk but are electronically impressed upon the surface material of the disk during the NEWing process, hence the expression 'soft sectored.' Track 18, being centrally located in the middle of the disk, is used by the 2040 DOS to hold the directory. The remaining 34 tracks are available to the user. If you're having trouble visualizing the tracks and sectors on a disk, think of the disk as a bull's eye target and the rings on the target as the tracks on the disk. Now if you cut the target into pie shaped wedges, you can see how the tracks are divided into sectors or data blocks.

Reading data into your program from the disk or writing data to the disk from your program using direct access is a two step process. To read data from a direct access file into your program, you must first load the data from the disk into one of the 256 byte disk buffers with the 'BLOCK-READ' disk utility command. Once the data block has been successfully loaded into the buffer, it can then be read into memory with a standard input# statement. The process is just the reverse when writing data from your program to a direct access file. You first write the data to a buffer using a PRINT# statement, then the data must be loaded from the buffer onto the disk with the 'BLOCK-WRITE' disk utility command. It is important to understand this process. The 'BLOCK-READ' command loads an entire 256 byte sector from the disk into a buffer and makes it available to your program through a standard INPUT# statement. The 'BLOCK-WRITE' command takes the contents of an entire 256 byte disk buffer and loads it onto a sector of the disk. It makes no difference if the record contained only one byte of data, it still occupies one entire 256 byte sector on the disk. Later I will explain how to place multiple records in a sector using the BUFFER-POINTER disk utility command.

One other area to cover is the BLOCK AVAILABILITY MAP (BAM). This is a reference map used by DOS to keep up with which blocks are being used and which blocks are available for use. To keep DOS from overwriting your direct access files with sequential files, you must flag those blocks on the BAM so DOS will know they are being used. As we will see later, this is done with the 'BLOCK-ALLOCATE' disk utility command.

Now that the general concept of direct access files and how they work on the Commodore 2040 Dual Drive Disk has been explained, the actual coding necessary to do the job will be examined line by line. Lines 500 to 680 would be part of the main program while lines 1000 to 1520 are subroutines which execute the various disk utility commands as required. The subroutines will be examined first, then the main program.

Lines 1000-1090

This subroutine is called after each disk utility or read/write command to check the error channel, channel 15, to see if a disk error has occurred. If an error has occurred, the error number and error message are displayed along with the track and sector address where the error occurred. If the error number is '00' then no error occurred and control returns to the main program.

Lines 1100-1190

This subroutine is used to allocate or reserve one sector on the disk through the use of the 'Block-Allocate' disk utility command in line 1110. The sector is flagged on the BAM so DOS will not use it later for storage of sequential files. Looking at line 1110, 'D' is the disk drive number, 'T' is the track number, and 'S' is the sector number. These values must be preset in the main program. After line 1110 requests the allocation, line 1120 reads the error channel to see if an error has occurred. If no error has occurred, control returns to the main program. If the error number is 65, this means that the requested block has already been allocated. But lo and behold, DOS has been kind enough to locate the track and sector numbers of the next available block and place them in ET$ and ES$. These values are placed in T and S and we again request allocation. Two important points must be remembered. DOS does not automatically allocate the next available block. It just tells you where it is. To allocate the block, you must reset 'T' and 'S' to the values returned in 'ET$' and 'ES$' and then reissue the 'Block-Allocate' command in line 1110. The other thing to remember is that for a block to be successfully allocated, a direct access file must be open when the 'Block-Allocate' command is given and that the block will not actually be reservered on the BAM until that file is closed. Allocating a block will not keep you from writing on it. It just keeps DOS from writing on it.

Lines 1200-1220

This subroutine is used to free a previously allocated block. The 'Block-Free' command is the exact opposite of the 'Block-Allocate' command. In line 1210, 'D' is the disk drive number and 'T' and 'S' hold the track and sector address of the block to be freed. After the command has been executed, line 1220 sends control to the error channel routine. If no error occurred, control returns to the main program. This routine is used to delete records from a direct access file by immediately releasing the block back to DOS. There is therefore no need for periodic system housekeeping to reclaim unused disk space. As with the 'Block-Allocate' command, a direct access file must be open when the 'Block-Free' command is given, and the block is not actually flagged as available until the file is closed.

Lines 1300-1320

This subroutine is used to make a block on the disk available for reading by your program. In the 'Block-Read' utility command, line 1310, 'CH' holds the channel number, 'D' holds the disk drive number, and 'T' and 'S' hold the track and sector addresses of the block to be read. When the command is executed, a 256 byte data block is read from the disk and placed in one of the disk buffers. The data can then be read into memory with a standard INPUT# statement. After the block is read in from the disk, line 1320 sends control to the error check routine and, if no error has occurred, control returns to the main program.

Lines 1400-1420

This subroutine uses the 'Block-Write' utility command to write the contents of a 256 byte buffer onto the disk. Again, 'CH' holds the channel number, 'D' holds the disk drive number, and 'T' and 'S' hold the track and sector addresses of the sector where the data is to be placed. Before this routine is executed, data should be placed in the buffer using the PRINT# statement. After execution, control passes to the error check routine and then back to the main program.

Lines 1500-1520

This routine uses the 'Buffer-Pointer' utility command to set the buffer pointer to the byte in the buffer where reading or writing is to begin. Correct use of this routine will allow multiple records per sector, giving more efficient utilization of disk space. In line 1510, 'CH' is the channel number and 'BP' is the byte pointer. If 'BP' is set to a value less than 1, it will be treated as though it were set to 1. If set to a value greater than 255, it will wrap around and begin at 1 again. Setting 'BP' to 260 has the same effect as setting it to 5. After execution, line 1520 directs control through the error check routine and back to the main program.

Lines 500 to 590

These lines show the coding necessary to write records to a direct access file. They would be part of the main program.

Line 510 opens the command/error channel, channel 15, and assigns it to file number 15. Channel 15 must be opened and assigned to a file before any communication between computer and disk can take place.

Line 520 sets the channel variable to 3 and the disk drive variable to 1. The channel can be set to any unused channel between 3 and 15. The drive number is set to 1 for the left drive or 0 for the right drive.

Line 530 opens file number 1 and assigns it to channel 'CH.' In this case, 3. The '#' tells DOS that this is a direct access file.

Line 540 is used to locate the next available sector and allocate it on the BAM. 'T' is set to 1 and 'S' is set to 0 because that is the address of the first sector on the disk. If that sector has been allocated, the next available sector is automatically located and allocated by the subroutine in lines 1200 to 1290.

Line 550 sets the buffer pointer to 1 so DOS will begin writing at the first byte in the buffer.

Line 560 writes the record data to the buffer beginning at the byte referenced by the buffer pointer.

Line 570 writes the buffer to the disk sector previously allocated in line 540. At this point, 'T' and 'S' must be saved along with whatever record key is being used so that this record can be found on the disk later.

Line 580 closes the direct access file opened in line 530.

Lines 600 to 680

This subroutine contains the coding necessary to read records from a direct access file. It would be part of the main program.

Line 610 opens file number 1 and assigns it to the preset channel in 'CH.' The '#' tells DOS that this is a direct access file.

Line 620 loads a block of data from the disk and places it in the buffer assigned to channel 'CH.' 'T' and 'S' must be set to the address of the sector where the desired record is located.

Line 630 sets the buffer pointer to begin reading at the first byte in the buffer.

Line 640 reads the record data from the buffer into the program.

Line 650 checks the status word.

Line 670 closes the direct access file.

This program will run as is. It will write the numbers 1 through 10 to the disk and then read them back in. If you add a line to the program that will print 'T,' 'S,' and the array 'A$' on the screen, you can verify that the correct data was written to and then read from the disk and even see to which sector it was written. Notice that each time the program is run, a new sector is allocated and used. These sectors will become wasted space on the disk unless you free them with the 'Block-Free' command. Add a GOSUB 1200 at line 665 and notice that now the program reuses the same sector each time. Why? What would happen if you moved the GOSUB 1200 to line 675? Why?

```
500 REM WRITE A DIRECT ACCESS RECORD
510 OPEN 15,8,15 :GOSUB 1000
520 CH=3 :D=1
530 OPEN 1,8,CH,"#" :GOSUB1000
540 T=1 :S=0 :GOSUB 1100
550 BP=1 :GOSUB1500
560 FOR I=1 TO 10 :PRINT#1,I CHR$(13); :NEXT I
570 GOSUB 1400
580 CLOSE 1
600 REM READ A DIRECT ACCESS RECORD
610 OPEN 1,8,CH,"#" :GOSUB 1000
620 GOSUB 1300
630 BP=1 :GOSUB 1500
640 FOR I=1 TO 10 :INPUT#1, A$(I)
650 IF ST THEN I=10
660 NEXT I
670 CLOSE 1
690 END
1000 REM ERROR CHANNEL INPUT ROUTINE
1010 INPUT#15, EN$,EM$,ET$,ES$
1020 IF EN$="00" GOTO 1090
1030 PRINT " DISK ERROR #" EN$ " " EM$ " " ET$ " " ES$
1040 INPUT " CONTINUE?  "; A$
1050 IF A$<>"Y" THEN STOP
1090 RETURN
1091 REM
1100 REM ALLOCATE 1 D/A BLOCK
1110 PRINT#15,"B-A";D;T;S
1120 INPUT#15,EN$,EM$,ET$,ES$
1130 IF EN$="00" GOTO 1190
1140 IF EN$="65" THEN T=VAL(ET$) : S=VAL(ES$) :GOTO 1110
1150 GOTO 1030
1190 RETURN
1191 REM
1200 REM FREE 1 D/A BLOCK
1210 PRINT#15, "B-F";D;T;S
1220 GOTO 1000
1291 REM
1300 REM READ D/A BLOCK
1310 PRINT#15, "B-R";CH;D;T;S
1320 GOTO 1000
1391 REM
1400 REM WRITE D/A BLOCK
1410 PRINT#15, "B-W";CH;D;T;S
1420 GOTO 1000
1491 REM
1500 REM SET BUFFER POINTER
1510 PRINT#15, "B-P";CH;BP
1520 GOTO 1000
```

Now we will explain how to write more than one record to a sector. If you've followed everything up to this point, especially the section on the 'Buffer-Pointer' command, then you have probably pretty well figured it out for yourself.

If each record in a direct access file occupies one entire sector of the disk, then each disk will only hold a maximum of about 670 records. If each record contained only a few bytes of data, this would be a totally unacceptable waste of valuable disk space. In order to achieve maximum use of the available disk space, we must pack the maximum number of records to a sector.

In order to do this it is necessary to reduce the record size to the minimum number of bytes that will store the necessary data. Most DOS allow data to be written to the disk in binary format like the data is stored in memory. In other words, integer data requires two bytes of disk space and floating point data requires five bytes. Although 2040 DOS is an excellent first release version, this type of disk packing is one of the standard DOS features not supported. Data is written to the disk in the same form it is written on the screen, each character takes one byte of disk space. In addition, numeric data includes leading and trailing blanks. For this reason it is usually more efficient to write data to the disk in string format. String data occupies one byte of disk space for each character in the string. In addition, if the record contains more than one data field, then each field must be followed by a CARRIAGE RETURN, CHR$(13), field delimiter. This requires one extra byte per field. If each field in the record is always the same size, in other words the record contains no string fields such as CUSTOMER NAME that vary in size from record to record, then all the fields can be concatenated into a single string field before writing the record to the disk. This could result in a considerable saving since no field delimiters would be required. Upon reading the record back in, it could be split up into the original fields with the MID$ statement.

Once the maximum record size has been determined, divide the record size in bytes into 255 to determine the maximum number of records that can be stored on a single sector of the disk. For example, if each record in the file has been determined to have a maximum length of 20 bytes including all necessary field delimiters, then by dividing 20 into 255 we see that we can store 12 records per sector. Since the zero byte is used by DOS as an EOI pointer, the first record begins in byte 1, the second record in byte 21, the third record in byte 31, etc. Now you will have to add a fourth field to your sequential pointer file. Besides record key, track address, and sector address, you must identify each record's position in the block. Then, to locate a specific record in the file, you would search the record key array for the desired record, use the corresponding track and sector addresses to read in the indicated sector, and then set the buffer pointer to the value in the corresponding record position field. Now you are ready to read the desired record into your program with a standard PRINT# statement.

Before winding this up, there is one other important area that should be covered and that is the correct way to write data to the disk. The following lines show several ways data can be written.

```
100 PRINT#1, A$, B, C%
200 PRINT#1, A$; B; C%
300 PRINT#1, A$ CHR$(13) B CHR$(13) C% CHR$(13);
400 FOR I = 1 TO 10 :PRINT#1, A$(I) :NEXTI
500 FOR I = 1 TO 10 :PRINT#1, A$(I), :NEXTI
600 FOR I = 1 TO 10 :PRINT#1, A$(I) CHR$(13); :NEXTI
```

Line 100

WRONG! Commas have the same skipping effect on the disk as they do on the screen. This would result in very inefficient use of disk space.

Line 200

WRONG! Semicolons are non printing characters and will not work as field delimiters. Any attempt to read A$ would read B and C% as well.

Line 300

CORRECT. This method will write a CARRIAGE RETURN, CHR$(13), field delimiter between each field and the semicolon on the end keeps OS from adding a trailing LINE FEED character to the last field.

Line 400

WRONG! The OS will add CARRIAGE RETURN and LINE FEED characters to each field. The CARRIAGE RETURN character is desired but the LINE FEED will become the first character in the following field and can cause numerous problems.

Line 500

WRONG! Same reason as line 100.

Line 600

CORRECT. The required CARRIAGE RETURN character is inserted between each field in the record and the semicolon keeps the OS from adding a LINE FEED character. The PET Operating System treats all data the same no matter if it is printing to screen, disk, or printer. For this reason, the last field in every PRINT# command should be followed by a semicolon to keep the OS from adding a LINE FEED character to the output data string. This LINE FEED character will become the first character in the following field and cause all kinds of headaches. It will crash your program with a data check error if you attempt to read the field in numeric format and can lead to erroneous comparisons if read in string format. This is true whether you are using direct access or sequential files. Data is much easier to read correctly from the disk if it was written correctly to the disk.

You should now be well versed in the theory of using direct access files on disk. Next comes the fun part, gaining actual experience reading and writing direct access files on your disk. Start with the program in lines 500-680 plus the subroutines in lines 1000 to 1520. When you are sure you know exactly what each line does, you can start experimenting around, adding lines, etc. When the program crashes, and it probably will several times, back up and don't try anything new until you know exactly what went wrong. Before you know it, you'll be the club expert on 2040 direct access files.

I'll be glad to answer any questions by mail if you include a self addressed stamped envelope. Good luck.

PET^tm Keyboard Interface SALE

MODEL KBIF-3 SALE PRICE : $125.00

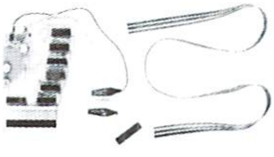
- Full all NEW ASCII Keyboard with upper & lower case letters. Case optional add $30 Interface installed and plugs into PET* and ready for use.
- Recognize all upper & lower case charactors numeric, punctuations and repeat key.
- 90% of all GRAPHICS are implemented.
- PET* keyboard can be used simultaneously.
- No modification to the PET* necessary.
- Completely assembled and checked out.

MODEL KBIF-2 SALE PRICE : $65.00

- SAME Interface as above without keyboard.
- Jumper selectable for data strobe polarity for your own keyboard.
- One ribbon cable and one connector included.

MODEL KBIF-1 SALE PRICE : $45.00

- INTERFACE with upper case characters, numeric and punctuations. Curser control set implemented.
- NO graphics, repeat key and lower case.
- Other features same as KBIF-2.



We accept checks, money order, VISA and MASTER CHARGE CARDS. Personal checks take 2 weeks to clear. Please ADD $6 for KBIF-3 and $3 for all others to cover shipping and handling within the continental U.S. Foreign orders please write for quote. Calif. residents add 6% sales tax. Allow upto 4 weeks for delivery. SEND FOR FREE SPECIFICATIONS.

EXCEL CO.
618 GRAND AVE
OAKLAND CALIF.
94610
TEL: (415) 465 4240

SEND ORDERS TO:

P. O. BOX 1147
EL CERRITO CALIF.
94530

ALL SALES END ON JAN. 31st. 1980

* PET is a registered trade make of Commodore Business Machine Inc.

THE SBC GAZETTE

Mastering The Ohio Scientific Challenger 1P, A Learn-By-Doing Approach

by Keith Russell and Dave Schultz
Total Information Services
Los Alamos, NM

The Ohio Scientific Challenger 1P (C1P) is the SUPERBOARD II single board computer in a cabinet with a power supply. It is destined to become a very popular personal computer. Its low cost, graphics features, and powerful BASIC language make it an attractive machine for many people. For most purchasers, the C1P will be your first computer. With little background or experience with computers, you will need some help and instruction on how to make the C1P work for you.

First, let's define some notation. We will use a consistent notation in this article to indicate what is to be typed on the keyboard (T:), what appears on the TV display (R:), and what indicates that blanks are to be typed (b). For example:

```
T: info ('RETURN' key)
```

means to type the characters contained on the line after the colon (:) and then type 'RETURN.'

```
R: response
```

means that the C1P will display this information on the TV after you type the previous line.

Blanks are important in some cases. When they are important they are specified by b. For example:

```
T: ?"ABbC" ('RETURN' key)
```

means that you should type ?, then ", then the letter A, then the letter B, then a space, then the letter C, then " followed by a 'RETURN'.

Now let's run that example all together:

```
T: ?"ABbC" ('RETURN' key)
R: AB C
```

The 'RETURN' key must be pressed at the end of each line. We will assume that you know that and will not use ('RETURN' key) in any more examples.

Now lets tackle how the C1P represents and stores numbers. You will learn how the C1P represents numbers by experimenting systematically. Each experiment (exercise) shows you what to type as input to your computer and the expected reply.

DATA REPRESENTATION ON THE C1P

A. *Largest Numeric Value* To find the largest floating-point number that the C1P can handle, run the following program.

Exercise: Test for the floating-point maximum.

```
T: NEW
T: 200 I = 1
T: 210 I = I*2
T: 220 PRINT I
T: 230 GO TO 210
RUN
```

A long series of numbers starting with

```
R: 2
R: 4
R: 8
R: 16
```

will be printed out; the last number will be

```
R: 4.2535E + 37
```

followed by

```
R: ?0-ERROR IN 210
```

This means that 8.50706 E + 37 was too large to represent.

Exercise: Modify the program above to display large negative floating-point numbers to determine the largest negative number that the C1P can represent. If the sign of the result alternates between plus and minus, you should try a different modification. Your result should show that the sign is independent of the maximum size permitted.

```
T:
T:
R:
...
R:
```

The largest negative number is ______.

B. *Memory Space Used* Different types of data require different amounts of memory. To determine the memory space required for each type, we will use the FRE function. FRE returns the amount of space remaining.

Exercise: Determine the amount of space used by a single floating-point value.

```
T: NEW
T: DIM A(100)
T: ?FRE(0)
R: 2913
```

This determines the amount of memory space left after reserving 100 floating-point locations. Next, determine the amount of space left after reserving 101 floating-point locations.

```
T: NEW
T: DIM A(101)
T: PRINT FRE(0)
R: 2909
```

The difference (4) is the number of bytes that one floating-point variable requires.

C. *Number of Significant Digits* The C1P can display six digits in a number even though more information can be stored in memory.

Exercise: Determine the number of digits displayed for floating-point numbers.

Note: The values given are the responses from FRE on a 4K machine. If you have an 8K machine, note the values. The difference should show the same result for the size of the variable.

```
T: PRINT 123456
R: 123456
```

This indicates that six digits can be displayed.

```
T: PRINT 1234567
R: 1.23457E + 06
```

This shows that the seventh digit is not displayed.

Exercise: Show how many digits of information can be saved in memory.

```
T: A = 1234560:PRINT A
R: 1.23456E + 06
T: B = 1234561:PRINT B
R: 1.23456E + 06
```

Even though the numbers entered differ by 1 in the seventh digit, the display shows that they are equal. Are they really?

Exercise: Test if the numbers entered are really equal.

```
T: IF A< > B THEN PRINT “< >”
R: < >
```

The response shows that the C1P can distinguish the difference of 1 in the seventh digit, even if it doesn't display the difference. Can the C1P distinguish a difference of 1 in the eighth digit?

```
T: C = 12345670:PRINT C
R: 1.23457E + 07
T: D = 12345671:PRINT D
R: 1.234567E + 07
```

The displayed values appear to be equal. Are they?

```
T: IF C < > D THEN PRINT “ < > ”
R:  < >
```

Since the C1P can distinguish between numbers that differ by one in the eighth digit, let's try a difference of 1 in the ninth digit.

```
T: C = 123456780:PRINT C
R: 1.23457E + 08
T: D = 123456781:PRINT D
R: 1.23457E + 08
T: IF C = D THEN PRINT “ = ”
R: =
```

It appears that the C1P cannot distinguish between two numbers that differ by one in the ninth digit.

The number of significant digits displayed is six and the number of digits saved in memory is approximately eight.

D. *Rounding* Since the C1P stores approximately eight digits in memory and only displays six digits, it must “round” to decide what to display.

Exercise: Determine how the C1P rounds numbers for display.

```
T: NEW
T: 100 A = 1234510
T: 110 FOR I = 1 TO 15
T: 120 B = A + I
T: 130 PRINT “A + ”;I;“ = ”;B
T: 140 NEXT I
T: RUN
R: A +  1 =  1.23451E + 06
...
R: A +  5 =  1.23452E + 06
...
R: A +  15 =  1.23453E + 06
```

From this display, you can see that 1234515 was rounded up to 1.23452E + 06 and 1234525 was rounded up to 1.23453E + 06. The C1P rounds the sixth digit up whenever the seventh digit is 5 (or more) and rounds it down whenever the seventh digit is 4 (or less).

These simple exercises show that you can learn quite a bit about your C1P (or any other personal computer) by doing some well chosen experiments. You can master your C1P. All it takes is a little experimenting.

Footnote:
This material is exerpted from the Total Information Services (TIS) Workbook 101 - Getting Started with Your OSI C1P. (Copyright © 1979 Total Information Services) Reprinted with permission of TIS.

Total Information Services (TIS) has been publishing tutorial workbooks for the Commodore PET since March 1978. They have now expanded their workbook series to include the Challenger 1P from Ohio Scientific.

SBC RESOURCES

Microtechnology Unlimited
P.O. Box 4596
Manchester, NH 03108

RNB Enterprises
2967 W. Fairmount Ave.
Phoenix, AZ 85017

Excert, Inc.
P.O. Box 8600
White Bear Lake, MN 55110

Connecticut Microcomputer
150 Pocono Rd.
Brookfield, CT 06804

Compute.
SBC Coordinator
900 Spring Garden St.
Greensboro, NC 27403

Micro
8 Fourth Lane
So. Chelmsford, MA 01824

Target, c/o Don Clem
RR 2
Spencerville, OH 45887

Seawell Marketing
P.O. Box 17170
Seattle, WA 98107

Ohio Scientific
1333 S. Chillicothe Rd.
Aurora, OH 44202

Synertek Systems Corporation
150 S. Wolfe Road
Sunnyvale, CA 94086

Total Information Services
P.O. Box 921
Los Alamos, NM 87544

Rockwell International
Microelectronic Devices
P.O. Box 3669
Anaheim, CA 92803

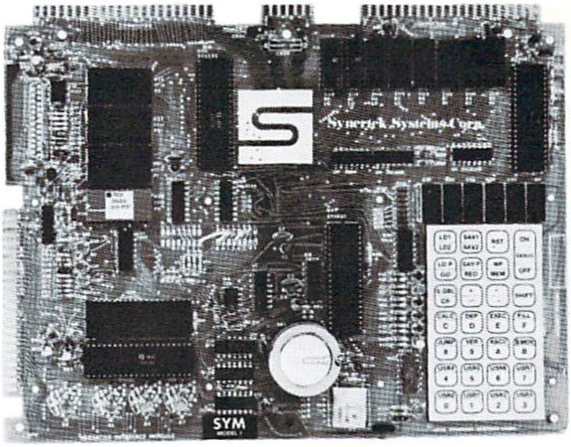
Commodore Business Machines, Inc.
3330 Scott Blvd.
Santa Clara, CA 95050

SYM-1, 6502-BASED MICROCOMPUTER

- FULLY-ASSEMBLED AND COMPLETELY INTEGRATED SYSTEM that's ready-to-use
- ALL LSI IC'S ARE IN SOCKETS
- 28 DOUBLE-FUNCTION KEYPAD INCLUDING UP TO 24 "SPECIAL" FUNCTIONS
- EASY-TO-VIEW 6-DIGIT HEX LED DISPLAY
- KIM-1* HARDWARE COMPATIBILITY

The powerful 6502 8-Bit MICROPROCESSOR whose advanced architectural features have made it one of the largest selling "micros" on the market today.

- THREE ON-BOARD PROGRAMMABLE INTERVAL TIMERS available to the user, expandable to five on-board.
- 4K BYTE ROM RESIDENT MONITOR and Operating Programs.
- Single 5 Volt power supply is all that is required.
- 1K BYTES OF 2114 STATIC RAM onboard with sockets provided for immediate expansion to 4K bytes onboard, with total memory expansion to 65, 536 bytes.
- USER PROM/ROM: The system is equipped with 3 PROM/ROM expansion sockets for 2316/2332 ROMs or 2716 EPROMs
- ENHANCED SOFTWARE with simplified user interface
- STANDARD INTERFACES INCLUDE:
  - —Audio Cassette Recorder Interface with Remote Control (Two modes: 135 Baud KIM-1* compatible, Hi-Speed 1500 Baud)
  - —Full duplex 20mA Teletype Interface
  - —System Expansion Bus Interface
  - —TV Controller Board Interface
  - —CRT Compatible Interface (RS-232)
- APPLICATION PORT: 15 Bi-directional TTL Lines for user applications with expansion capability for added lines
- EXPANSION PORT FOR ADD-ON MODULES (51 I/O Lines included in the basic system)
- SEPARATE POWER SUPPLY connector for easy disconnect of the d-c power
- AUDIBLE RESPONSE KEYPAD



Synertek has enhanced KIM-1* software as well as the hardware. The software has simplified the user interface. The basic SYM-1 system is programmed in machine language. Monitor status is easily accessible, and the monitor gives the keypad user the same full functional capability of the TTY user. The SYM-1 has everything the KIM-1* has to offer, plus so much more that we cannot begin to tell you here. So, if you want to know more, the SYM-1 User Manual is available, separately.

SYM-1 Complete w/manuals	**$229.00**
SYM-1 User Manual Only	**7.00**
SYM-1 Expansion Kit	**60.00**

Expansion includes 3K of 2114 RAM chips and 1-6522 I/O chip.

SYM-1 Manuals: The well organized documentation package is complete and easy-to-understand.

SYM-1 CAN GROW AS YOU GROW. It's the system to BUILD-ON. Expansion features that are available:

BAS-1 8K Basic ROM (Microsoft)	**$ 89.00**
KTM-2 (Complete terminal less monitor)	**319.00**

QUALITY EXPANSION BOARDS DESIGNED SPECIFICALLY FOR KIM-1, SYM-1 & AIM 65

These boards are set up for use with a regulated power supply such as the one below, but, provisions have been made so that you can add onboard regulators for use with an unregulated power supply. But, because of unreliability, we do not recommend the use of onboard regulators. All I.C.'s are socketed for ease of maintenance. *All boards carry full 90-day warranty.*

All products that we manufacture are designed to meet or exceed industrial standards. All components are first qualtiy and meet full manufacturer's specifications. All this and an extended burn-in is done to reduce the normal percentage of field failures by up to 75%. To you, this means the chance of inconvenience and lost time due to a failure is very rare; but, if it should happen, we guarantee a turn-around time of less than forty-eight hours for repair.

Our money back guarantee: If, for any reason you wish to return any board that you have purchased directly from us within ten (10) days after receipt, complete, in original condition, and in original shipping carton; we will give you a complete credit or refund less a $10.00 restocking charge per board.

VAK-1 8-SLOT MOTHERBOARD

This motherboard uses the KIM-4* bus structure. It provides eight (8) expansion board sockets with rigid card cage. Separate jacks for audio cassette, TTY and power supply are provided. Fully buffered bus.

VAK-1 Motherboard	**$129.00**

VAK-2/4 16K STATIC RAM BOARD

This board using 2114 RAMs is configured in two (2) separately addressable 8K blocks with individual write-protect switches.

VAK-2 16K RAM Board with only 8K of RAM (½ populated)	**$239.00**
VAK-3 Complete set of chips to expand above board to 16K	**125.00**
VAK-4 Fully populated 16K RAM	**325.00**

VAK-5 2708 EPROM PROGRAMMER

This board requires a +5 VDC and ±12 VDC, but has a DC to DC multiplyer so there is no need for an additional power supply. All software is resident in on-board ROM, and has a zero-insertion socket.

VAK-5 EPROM Programmer w/2708 adapter	**$249.00**
VAK-5A Single voltage 2716 adapter	**45.00**

VAK-6 EPROM BOARD

This board will hold 8K of 2708 or 2758, or 16K of 2716 or 2516 EPROMs. *EPROMs not included.*

VAK-6 EPROM Board	**$119.00**

VAK-7 COMPLETE FLOPPY-DISK SYSTEM (Oct '79)

VAK-8 PROTYPING BOARD

This board allows you to create your own interfaces to plug into the motherboard. Etched circuitry is provided for regulators, address and data bus drivers; with a large area for either wire-wrapped or soldered IC circuitry.

VAK-8 Protyping Board	**$39.00**

POWER SUPPLIES

ALL POWER SUPPLIES are totally enclosed with grounded enclosures for safety, AC power cord, and carry a full 2-year warranty.

FULL SYSTEM POWER SUPPLIES

This power supply will handle a microcomputer and up to 65K of our VAK-4 RAM. ADDITIONAL FEATURES ARE: Over voltage Protection on 5 volts, fused, AC on/off switch. Equivalent to units selling for $225.00 or more.

Provides +5 VDC @ 10 Amps & ±12 VDC @ 1 Amp

VAK-EPS Power Supply	**$119.00**
VAK-EPS/AIM provides the same as VAK-EPS plus 24V unreg.	**149.00**

KIM-1* Custom P.S. provides 5 VDC @ 1.2 Amps and +12 VDC @ .1 Amps

KCP-1 Power Supply	**$39.00**

SYM-1 Custom P.S. provides 5 VDC @ 1.4 Amps

VCP-1 Power Supply	**$39.00**

*KIM is a product of MOS Technology

RNB ENTERPRISES INCORPORATED

2967 W. Fairmount Avenue
Phoenix AZ. 85017
(602)265-7564

master charge VISA

Add $2.50 for shipping and handling per order

Review

6502 Macro Assembler And Text Editor SYM Version $49.95

Carl W. Moser
3239 Linda Drive
Winston-Salem, North Carolina 27106

If you want to become serious about your business application or computer hobby, an assembler is a must. Many programs written in BASIC take too long to execute. I recently wrote a BASIC program which implemented a successive approximation analog-to-digital converter. Sample frequency was limited by the program to a few times per second. When the program was rewritten in machine language, the maximum sample rate increased 100 fold.

Only trivial programs should be hand-assembled. It takes too long and corrections are quite tedious. However, a good assembler at a reasonable price is hard to find. Carl Moser is offering a super assembler for the SYM (and PET, Apple and other 6502 machines). It has features normally found on much larger systems, e.g., macro capability. One line of source code in your program is expanded into many lines according to a previous definition. Assembly language programming should be facilitated once a library of macros is built up (much like FORTRAN subroutines).

I did have some trouble loading the original tape. I put the blame on SYM's 1.0 monitor and its notorious cassette problems. My back-up copy, made with the new 1.1 monitor on my system, works every time. The assembler/text editor requires memory from $2000 - $3FFD. Default file boundaries for the SYM version are:

Text file: $200 - $BFC
Label file: $C00 - $EFC
Relocatable buffer: $F00

The system I am using (4K SYM, KIM-3(8K), and Seawell Little Buffered Motherboard) was able to run without changing the default boundaries.

In the week that I have had to test the program I have not exercised every feature of the assembler/text editor. However, every thing I have tried has worked! Some of my previous experience has been with assemblers written in BASIC and the difference in execution times for Moser's assembler (written in machine language and much faster) is absolutely phenomenal. I am not about to list all the features — you must look at the 50 page manual to appreciate the available commands for both the text editor and the assembler.

Even though I was very pleased with the package I have two minor "carping" points. One, the manual is written in a general manner with specifics for each version (PET, APPLE, and SYM) in appendices at the end. It is a little difficult for the SYM user (me) to find what he needs without a lot of paper shuffling. Two, the assembler requires you to specify zero page addressing modes with an asterisk. I would prefer that the assembler use this whenever possible with provision for a manual override. Once I forgot the asterisks in an early try at assembling. However, the text editor has a convenient "EDIT" command and I had no problem inserting the asterisks where needed. I like a forgiving program and I heartily recommend this package to serious SYM computer buffs.

Reviewed by Harvey B. Herman

Review

The Challenger 1P

W. Keith Russell
Santa Fe, NM

INTRODUCTION

The Ohio Scientific Challenger 1P, relatively new on the horizon of lower-priced, full-feature BASIC-in-ROM computers, deserves serious consideration by anyone who is interested in convenient programming in BASIC with an all-in-one, ready-to-run, plug-in microcomputer, but who has limited funds.

In this article I will summarize some of my experiences with OSI (that's Ohio Scientific Instruments) and the C1P, along with comments on the relative merits or demerits of the unit. It should be noted that the C1P, which sells for $349, is also available as the Superboard II for $279; the Superboard comes without a case and requires the addition of a power supply, but is otherwise identical to the C1P. Most of my comments should apply to it as well.

I ordered my computer with some trepidation because of all the depressing stories I had heard about delivery of other systems. Delivery took nine days.

I called my mail order dealer collect several times, both before and after buying my computer, and had long conversations, at his expense, asking what must have seemed to him to be trivial questions. I don't know if OSI and its dealers always provide that kind of service, but if they do, one shouldn't be hesitant to invest in their products by mail if they aren't available locally.

FEATURES

The C1P is a "single-board" computer, with CPU, BASIC-in-ROM, RAM, video display, cassette interface and keyboard all on one board. The C1P must be expanded externally, while the C2-4P (at $598) can be expanded internally; the C1P expands to 32K of RAM memory, the C2-4P to 40K. Finally, the screen display on the C1P is limited to 24 rows x 24 columns, as compared to the C2-4P's 32 x 64.

***** AIM-65 *****

EXCERT INCORPORATED

P/N		Qty 1-9
A65-1	AIM-65 w/1K RAM	**$375**
A65-4	AIM-65 w/4K RAM	**$450**
A65-A	Assembler ROM	**$85**
A65-B	BASIC ROMS	**$100**

EXCERT has concentrated on the AIM-65 to guarantee **YOU** that the products we offer are fully compatible. We know how these products work since they are used in our systems. EXCERT can help you get the system **YOU** want!

ACCESSORIES

P/N		
PRS1	+5V at 5A, +24V at 2.5A, ±12V at 1A (does not fit inside ENC1)	**$95**
PRS2	+5V at 5A, +24V at 1A (mounts inside ENC1)	**$50**
ENC1	AIM-65 case with space for PRS2 and MEB1 or MEB2 or VIB1	**$45**
ENC2	ENC1 with PRS2 inside	**$100**
TPT1	Approved Thermal Paper Tape, 6/165' rolls	**$10**
MCP1	Dual 44 pin Mother Card takes MEB1, VIB1, PTC1	**$80**
MEB1	8K RAM, 8K Prom sockets, 6522 and programmer for 5V Eproms (2716)	**$245**
PTC1	Prototype card same size as KIM-1, MEB1, VIB1	**$40**
VIBI	Video bd with 128 char, 128 user char, up to 4K RAM, light pen and ASCII keyboard interfaces	**$245**
MCP2	Single 44 pin (KIM-4 style) Mother Card takes MEB2, PGR2 and offers 4K RAM sockets	**$119**
	with 4K RAM	**$169**
MEB2	16K RAM bd takes 2114's	**$125**
	with 8K RAM	**$225**
	with 16K RAM	**$325**
PGR2	Programmer for 5V Eproms with ROM firmware, up to 8 Eproms simultaneously	**$195**
	with 4 textool skts	**$245**

SYSTEMS

"ASSEMBLED & TESTED"

All AIM-65 systems are self contained and have the power supply (PRS2) mounted inside ENC1.

"STARTER" SYSTEMS

P/N		
SB65-1	A65-1 in ENC2	**$475**
SB65-4	A65-4 in ENC2	**$540**
SB65-4B	Same Plus BASIC	**$640**

"EXPANDED" SYSTEMS

P/N		"B" MEB1	"C" MEB2	"D" VIB1
E_65-4	A65-4, ENC2, w/one MEB1, MEB2, or VIB1	**$775**	**$855**	**$775**
E_65-4B	Same Plus BASIC	**$875**	**$955**	**$875**

Higher quantities and systems with other options quoted upon request!

Mail Check or Money Order To:

EXCERT, INCORPORATED
Attn: Laurie
P.O. Box 8600
White Bear Lake, MN 55110
(612) 426-4114

Add $5.00 for shipping, insurance, and handling.

Minnesota residents add 4% sales tax.

Benchmark tests applied by Rugg and Feldman ("BASIC Timing Comparisons ... revised and updated," *Kilobaud*, Oct. 1977, pp. 20-25) show that (at least at that time and on the specific tasks tested) the Challenger 2P had the fastest floating point BASIC of all stock 8-bit microcomputers tested, including the PET and most other popular models. My C1P uses the same version of BASIC, and my own tests confirm the reported times. The Challengers require approximately 42 seconds for the longest task, as compared to as much as 320 seconds for some other systems. The PET took 51 seconds; part of the reason that it is slower is that it has 10-digit BASIC, compared to the Challenger's 6½. Unfortunately, the TRS-80 was not included in the comparison, but the authors point out that the 6502 microprocessor of the Challenger and PET is inherently faster than the Z-80, which the TRS-80 uses. Although speed is not generally considered to be a major concern, there are cases in which it makes a difference — even with my fast BASIC, a simple game of War I programmed for my kids from *Creative Computing's Basic Computer Games* takes a full minute to shuffle the cards before every game. Any slower and the kids would switch to a regular TV channel!

GRAPHICS

The character generator ROM can display 256 different characters, including upper case, lower case, alpha, numeric, special punctuation, graphics characters, and gaming characters. Included are such things as arrows, tanks, men, houses, and airplanes. Using the POKE command (in BASIC), these can be displayed in any desired position on the screen, or made to move in various directions across the screen. They are fun to use and make interactive graphics feasible.

PRICE

A C1P system complete with direct-wired monitor and tape recorder, ready to plug in and use, is available from OSI (for around $500, I believe), but the real saving comes in buying the C1P alone at $349 and adding your own tape recorder and standard TV. With the 24 x 24 display this provides a perfectly usable system.

A working C1P system can be developed for about $450; this includes the C1P, a low-priced TV and tape recorder, and a $10 RF modulator (available from most dealers) to feed the computer signal to the TV.

PROBLEMS?

While the TRS-80 has its Level I BASIC, the standard PET its nonstandard keyboard, the C1P has its 24 x 24 screen display. Twenty-four lines are okay — after all, many popular units have only 16. However, 24 characters per line is a big limitation. Almost all published programs assume at least 32, and some are written for a 64- or even 80-character width. The result is that many PRINT statements have to be rewritten, and some tables are impossible to display. Admittedly, this is not a serious problem, but it is a highly frustrating one. On the other hand, this is one of the main factors in the original low price of the C1P, and helps make it possible to use a standard TV. You'll have to weigh the advantages against the disadvantages. As previously noted, OSI does well with graphics.

While the 8K BASIC-in-ROM you receive with the C1P is more powerful and flexible than the TRS-80's Level I 4K BASIC, it is less powerful than either Level II or the standard PET BASIC. The only way to upgrade it is with disk BASIC. It is powerful enough for most "personal" applications.

Finally, there's a problem not with the computer itself, but with the aids for using it. Although OSI provides a looseleaf binder full of information about the C1P, the quality of the documentation is not the best. (Editor's note: They're not alone ... more next issue.) One example is the omission of information such as how to save a machine code program on tape (we're told how to load one from tape!).

WILL THE C1P ACHIEVE FAME?

There has not seemed to be a great deal of interest in OSI's Challengers in the past, at least among personal users. One reason is that they have not been readily available in local outlets. Many buyers will more readily invest in a machine they've tried out at a local store, rather than buy sight unseen a C1P which they know little about.

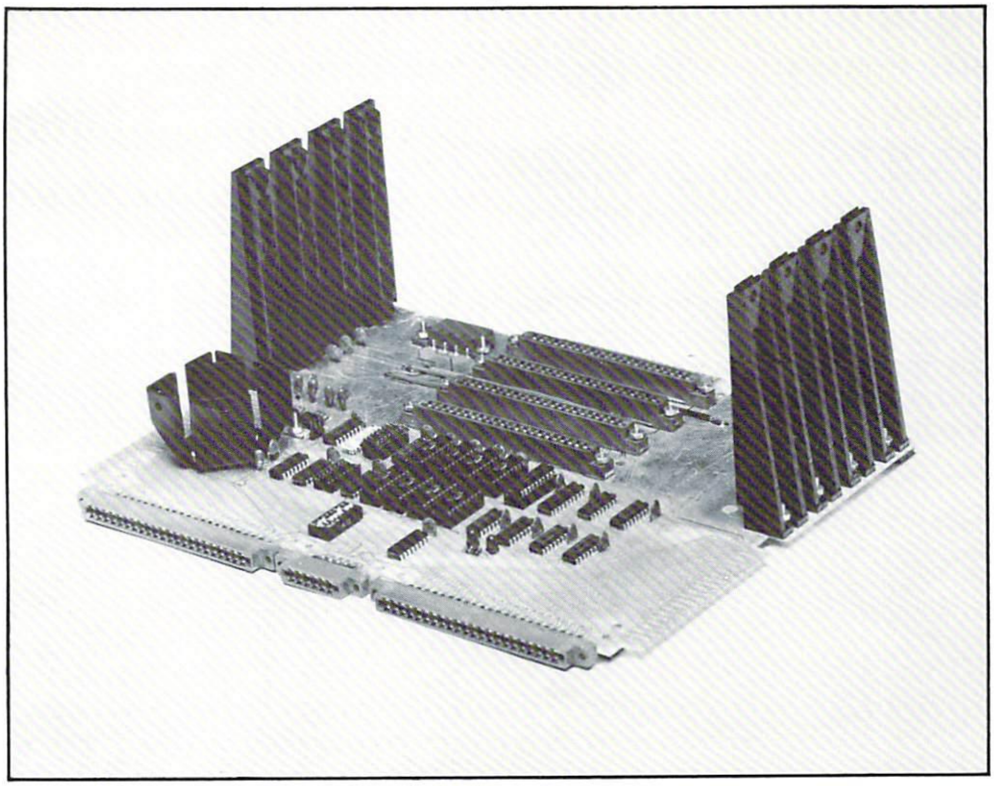
In addition, users' groups, from which a novice can learn about his or her system, have been hard to find. The only relevant publication I'm aware of is the *Challenger Times* (formerly *Independent OSI Users Newsletter*,) published by Newton Software Exchange, P.O. Box 518, Newton Corner, MA 02158. This is typically a 4-page, 8½ x 11 publication which publishes readers' questions and problems along with an occasional short program, and may be too technical for many owners.

Software has also been hard to come by. My experience has been slow delivery and disappointing results. This software deficit cannot readily be overcome by ordering elsewhere; while ads for independently-produced TRS-80 and PET programs fill the pages of the micro magazines, little has been available for the Challengers.

Similarly, additional hardware and peripherals such as disk drives and printers have generally been available only through OSI. On the positive side, OSI's prices for peripherals seem quite reasonable, and because the C1P is compatible with many peripherals previously developed for OSI's business systems, they are available now; there should be little waiting around for new equipment to be developed, such as owners of other micros have often had to endure.

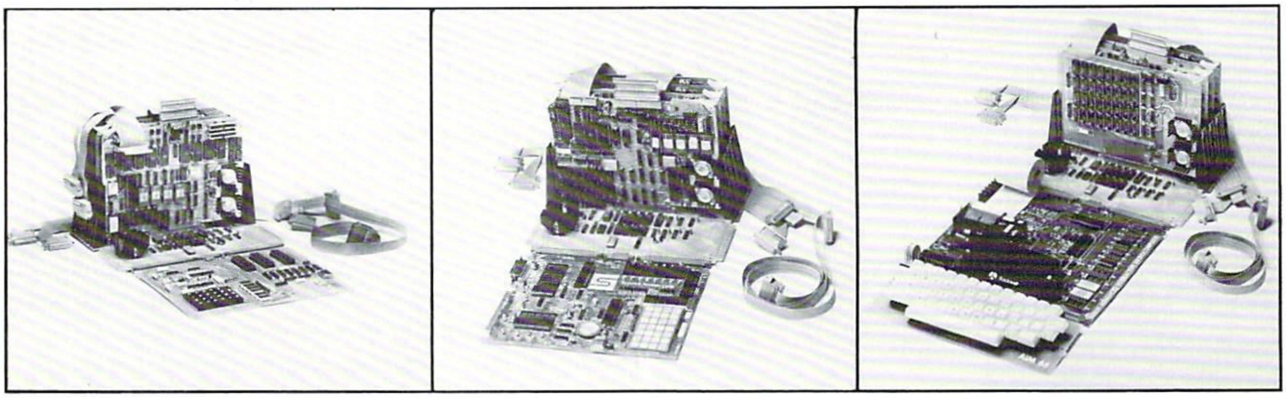
Prospects seem to be improving in other areas as well. Articles on OSI and the Challengers are appearing more regularly in the computer magazines now, OSI is stepping up its advertising, and the company is reportedly looking for more retail outlets, including department stores. More sales will stimulate the development of more software and compatible hardware. And that in

Introducing SEAWELL's



Little Buffered Mother

The ultimate Motherboard for any KIM-1, SYM-1, or AIM-65 system



Features:

- 4K Static RAM on board
- +5V, +12V, and −12V regulators on board
- 4 +1 buffered expansion slots
- Accepts KIM-4 compatible boards
- Full access to application & expansion connector
- LED indicators for IRQ, NMI, and power-on
- Also compatible with SEA-1, SEA-16, the PROMMER, SEA-PROTO, SEA-ISDC, and more
- Onboard hardware for optional use of (128K addressing limit)
- Mounts like KIM-4 or with CPU board standing up
- 10 slot Motherboard expansion available - SEAWELL's Maxi Mother

Standard	**$139**
w/4K RAM	**$189**

Assembled Only

For further information contact:

SEAWELL Marketing Inc.
P.O. Box 17006
Seattle, WA 98107

SEAWELL Marketing Inc.
315 N.W. 85th
Seattle, WA 98117
(206) 782-9480

turn should help the current owners.

AND FINALLY...

For some of us, the C1P may be the only complete computer system within reach of a limited budget. You will have to learn BASIC on your own (unless you already know it, in which case you have a good head start); you will at times have to struggle through less-than-adequate documentation; and you may have to write most of your programs yourself for a time. On the bright side, the C1P is not just a cheap substitute. While it may not be as flexible as some more high-priced systems, it does compare favorably with many selling for several hundred dollars more.

Aim 65 users now have a newsletter called The Target. The Target contains articles on using the printer, display, keyboard, basic programs as well as machine language and product reviews. Contact The Target c/o Donald Clem RR#2 Spencerville, OH 45887. The cost is $5 in the US and Canada ($12 elsewhere) for six bimonthly issues. Please include payment with order.

AIM 65 Review

by Donald Clem, RR#2, Conant Rd.,
Spencerville, OH 45887

One of the latest single board computers to appear on the market is the AIM 65 from Rockwell International of Anaheim, California. The main attributes of the AIM 65 which set it apart from some earlier single board computers are its full size keyboard and on-board printer.

The most obvious elements of the AIM 65 are the keyboard, display, printer, electronics, and two dual 22 pin connectors for expansion. The keyboard has 54 keys which support 69 functions. When in the monitor command mode, approximately 1/3 of the keys are used to implement the various commands. Three of the keys may be user defined to perform functions desired by the user. At this point, the versatility of the AIM 65 becomes apparent.

The display is 20 characters wide and uses 16 segment display devices. The 16 segments allow greater readability than a 7 segment display. The display uses internal latches and decoding so no processor overhead is required to refresh the display. This approach does increase power needs.

A 5x7 dot matrix thermal printer is provided which uses 2¼ inch wide paper. It is 20 characters wide and prints 64 ASCII characters. It can generate program listings whenever desired. The printer can echo everything shown on the display or be disabled and print nothing. The printer can be switched on and off from the keyboard or through program control. In my opinion, the printer has made the purchase of the AIM 65 worthwhile.

The standard AIM 65 electronics are the 6502 processor, several I/O ports, ram and rom. One of the I/O ports, a 6522, is completely available for user interfaces. The remaining I/O supports the monitor. The minimum AIM configuration comes with 1K of 2114 ram. The on board ram may be expanded to 4K. 4K should be enough for most AIM dedicated applications. For general purpose use, additional ram may be required. 12K of additional rom (2332's) may be added if desired. An optional Assembler and 8K basic is available.

All LSI components are mounted in sockets except an I/O port mounted directly to the display. A completely socketed board would have been nice, but this would have increased the price.

The two edge connectors at the back of the AIM are claimed to be Kim-1 compatible. They are compatible when the 6502 bus signals are considered, but when considering the signals specific to either the AIM 65 or the Kim-1, they differ. In 99% of the cases, these differences will make little difference, but the user should be aware that they do exist.

Two cassette recorders may also be added for low-cost mass storage. The recorders may be used under remote control if desired. Some recorders require more current than the AIM 65 remote circuitry can supply and, therefore, eliminate the remote control feature. This drawback can be remedied by adding relays.

The documentation for the AIM 65 includes a 6500 Hardware Manual, 6500 Programming Manual, AIM 65's User Guide and Monitor Listing, a wall-size schematic, a Programmers Reference Card and an AIM 65 Reference Card. The initial AIM 65's User Guide contained a multitude of errors, but Rockwell has since supplied revised correction pages. The User's Guide measures 1-1/8 inches thick and provides step-by-step examples on how to use the AIM 65. The optional Basic interpreter is by Microsoft and quite powerful.

The power requirements for the minimum configuration are about 2 amps at 5 volts and 2 amps peak at 24 volts (.5 amps average) (used for the printer only).

In summation, I would consider the extensive 8K monitor system a value approaching the price for the AIM 65. On top of this, I would add that it also contains the printer, making it an excellent value at the $375 needed for minimum configuration.

ACCOUNTS RECEIVABLE FOR THE PET®

32K
commodore CBM
commodore PET professional computer
commodore CBM tractor printer

This Accounts Receivable program is written for use with the Commodore 32K computer, dual disk drive and printer (either tractor or friction feed). It is ideal for small to medium sized businesses that require fast, accurate billings and statements with a desire for information about account balances and activity.

The program offers a unique combination of desirable bookkeeping and billing features combined with excellent graphics that allow users to utilize the program quickly, easily and without extended training periods. Among the outstanding features included are:

- Period-to-date sales summary itemized by sales category.
- Immediate access to account data including: number of invoices outstanding; outstanding balance; date account was opened; date of last transaction; itemized listing on monitor of all outstanding invoice data including partial payments and credit balances.
- Aged accounts receivable statements with automatic printing of aged statements of account for active accounts.
- Payments may be entered either against invoice number or outstanding balance. A printed statement of payments received shows date, amount, account name and number, check number or notation for cash payment, and listing of all invoices credited to provide an audit trail of transactions.
- Single or multiple item invoices with automatic extensions and calculaton of multiple line items.
- Multiple classifications of account within taxable or non-taxable categories.
- Automatic calculation of sales tax for taxable accounts.
- Efficient disk storage using variable length files for maximum data base storage.
- Formatted printing for legible invoices and statements allows the use of inexpensive stock paper.
- Full prompting leads even novice operators through the program without difficulty.
- Restricted access code limits unauthorized use.

HOW TO ORDER: Send your check or money order for the amount of order and shipping charges. Allow two weeks for personal checks to clear. Send to:

COMPUTER POWER for business

1325F Tompkins
Madison, WI 53716

CALL
608 221-1054
ask for Huron
608 274-1733
ask for Kenn

FREE with a computer system purchased from us, or $295 for the program, a complete user manual, and a one-year update service.

Send for your FREE user's manual today!

IF YOU HAVE YOUR COMPUTER, send $295 and $5 handling and shipping to the address below to receive your Accounts Receivable software. Mastercharge and Visa orders will be shipped same day.

IF YOU NEED A COMPUTER, we can supply the Commodore Business Machine, 32K with business keyboard, dual disk drive, tractor feed printer, two required connecting cables, a starter supply of paper, and 10 diskettes in a library file box, for $3,699.* Buy your computer system from us and we'll give you the Accounts Receivable software package at NO ADDITIONAL CHARGE! Please add $30 for handling and insured shipping.

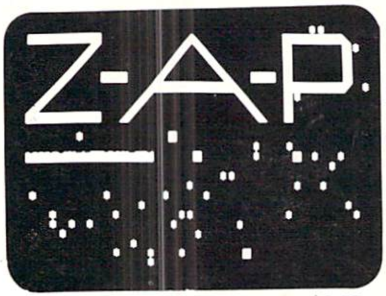
NOW IN STOCK! Ninety percent of items are shipped from stock, within one day of payment.

* Price subject to change without notice

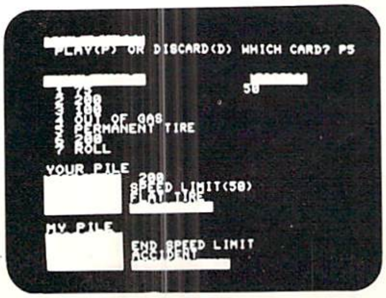
master charge
VISA®

"Your one best source for disk business software for the commodore Business Machine."

Software for the PET

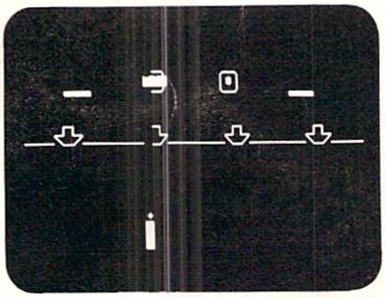


ZAP $6.95

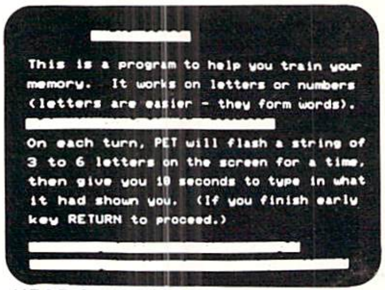


```
PLAY(P) OR DISCARD(D) WHICH CARD? P5

1 75                               50
2 200
3 100
4 OUT OF GAS
5 PERMANENT TIRE
6 200
7 ROLL
YOUR PILE
          200
          SPEED LIMIT(50)
          FLAT TIRE
MY PILE
          END SPEED LIMIT
          ACCIDENT
```

1000 MILES $9.95

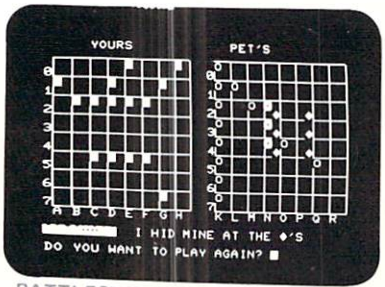


SHOOTING GALLERY $9.95



```
This is a program to help you train your
memory.  It works on letters or numbers
(letters are easier - they form words).

On each turn, PET will flash a string of
3 to 6 letters on the screen for a time,
then give you 10 seconds to type in what
it had shown you.  (If you finish early
key RETURN to proceed.)
```

HEAD START/AS-IMS $9.95



```
I HID MINE AT THE ♦'S
DO YOU WANT TO PLAY AGAIN? ■
```

BATTLESHIP $9.95

ACT Petsoft

We are proud to announce that PROGRAMMA INTERNATIONAL, INC. is now the exclusive representative and distributor of all software developed by ACT PETSOFT in the United Kingdom. Over 100 new PET programs will be released within the next three months containing exciting games and applications. See our ads or write for further information.

WORD PROCESSOR FOR THE PET

The PROGRAMMA Word Processor for the Pet is a suitable text processor that does exactly what you require, without having to expose the user to a lengthy learning and training session. Versions are available for the OLD and NEW ROM Pets, and support for various types of printers is available. The system can print the completed text either on the screen or on a printer. There are several modes of operation offered by the Word Processor. Text can be edited, text can be loaded from cassette, text can be saved to cassette, text can be printed to the CRT or printer, text can be read unto the screen. The system is very user oriented and simple to operate.

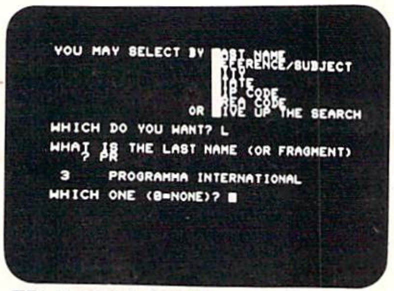
RS-232 Word Processor	**$19.95**
AXIOM Word Processor	**19.95**
Selecterm Word Processor	**19.95**

PAS-PERSONAL ACCOUNTING SYSTEM

The PAS System for the Pet relies heavily on the Pet's data file capabilities to generate and validate files containing a detailed description of your financial transactions. Designed specifically to be used with your check register as the data source, PAS consists of six programs including those to generate and edit data files, balance the checkbook, reconcile the bank statement, report checks that are outstanding, and summarize transactions over a period of time. Three files are generated by the PAS System: monthly transactions, outstanding checks and summary. The system is designed to operate with either the OLD or NEW ROM Pets using the cassette as the mass storage device. A version for the COMPU-THINK Disk unit is also available.

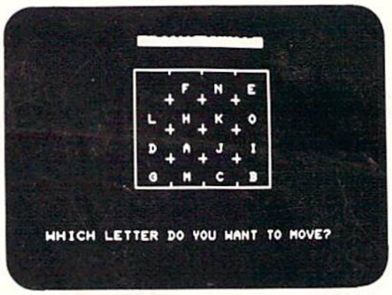
PAS on cassette	**$19.95**
PAS on COMPU-THINK Disk	**24.95**

All orders include 3% postage and handling.
Pet is a registered trademark of Commodore International.
California residents add 6% Sales Tax.
VISA & MASTERCHARGE accepted.



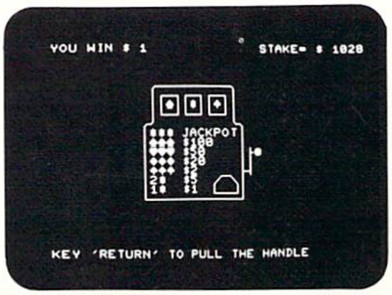
```
YOU MAY SELECT BY LAST NAME
                  REFERENCE/SUBJECT
                  CITY
                  STATE
                  ZIP CODE
                  AREA CODE
               OR GIVE UP THE SEARCH
WHICH DO YOU WANT? L
WHAT IS THE LAST NAME (OR FRAGMENT)
   ? PR
 3     PROGRAMMA INTERNATIONAL
WHICH ONE (0=NONE)? ■
```

TELEPHONE BOOK $6.95



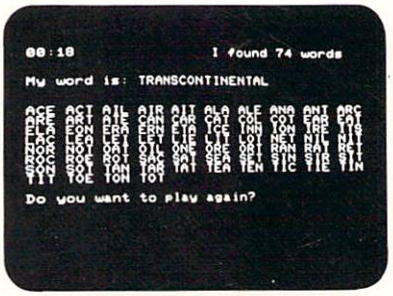
```
 + F + N + E
L + H + K + O
D + A + J + I
G   M   C   B

WHICH LETTER DO YOU WANT TO MOVE?
```

LETTER SQUARES $6.95



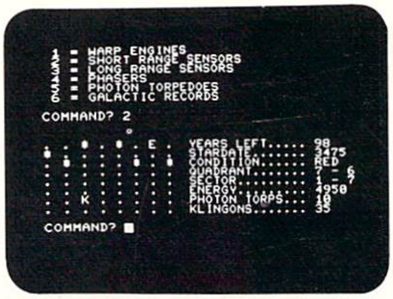
```
YOU WIN $ 1                STAKE= $ 1028

            JACKPOT
            $100
            $50
            $20
            $2
        2   $5
        1   $1

KEY 'RETURN' TO PULL THE HANDLE
```

SLOT MACHINE $9.95



```
00:10                I found 74 words

My word is: TRANSCONTINENTAL

ACE ACT AIL AIR AIT ALA ALE ANA ANT ARC
ARE ART ATE CAN CAR CAT COL COT EAR EAT
ELA EON ERA ERN ETA ICE INN ION IRE ITS
LAC LEA LEI LET LIE LIT LOT NET NIL NIT
NOR NOT OAT OIL ONE ORE ORT RAN RAT RET
ROC ROE ROT SAC SAT SEA SET SIN SIR SIT
SON SOT TAN TAR TAT TEA TEN TIC TIE TIN
TIT TOE TON TOT
Do you want to play again?
```

TRACE-A-WORD $9.95



```
1 = WARP ENGINES
2 = SHORT RANGE SENSORS
3 = LONG RANGE SENSORS
4 = PHASERS
5 = PHOTON TORPEDOES
6 = GALACTIC RECORDS
COMMAND? 2

. . * . * . E .   YEARS LEFT..... 98
* . . . . . . .   STARDATE....... 3475
. * . . . * . *   CONDITION...... RED
. . . . . . . .   QUADRANT....... 7 - 6
. . . . . . . .   SECTOR......... 1 - 7
. . . . . . . .   ENERGY......... 4950
. . K . . . . .   PHOTON TORPS... 10
. . . . . . . .   KLINGONS....... 35
COMMAND? ■
```

STAR TREK $9.95

PROGRAMMA
INTERNATIONAL, Inc.
3400 Wilshire Blvd.
Los Angeles, CA 90010
(213) 384-0579
384-1116
384-1117

Dealer Inquiries Invited

PROGRAMMA

Software Products